

***United States Court of Appeals
for the Second Circuit***



APPENDIX

75-7604

United States Court of Appeals

For the Second Circuit.

CAPRI JEWELRY INCORPORATED and
TANCER & TWO, Inc.,
Plaintiffs-Appellees,

v.

HATTIE CARNEGIE JEWELRY ENTERPRISES, LTD.,
Defendant-Appellant,

and

BILL G. JAMES,
Defendant.

ON APPEAL FROM THE UNITED STATES DISTRICT COURT
FOR THE SOUTHERN DISTRICT OF NEW YORK.

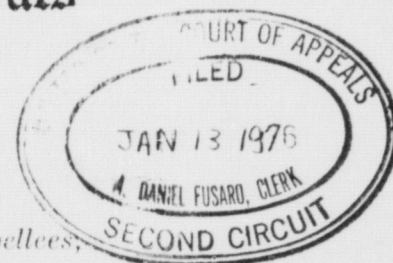
Appendix Volume II—Exhibits.

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PLAINTIFFS' EXHIBIT 1.

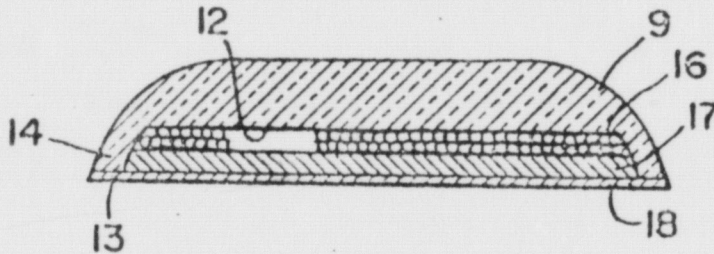
United States Patent [19]

James

[11] 3,802,945

[45] Apr. 9, 1974

- [54] HEAT SENSITIVE NOVELTY DEVICE 3,574,043 4/1971 Luber et al. 161/5
 [76] Inventor: Bill G. James, 1895 Cordilleros Rd., 3,637,291 1/1972 Kessler et al. 40/28 C
 Redwood City, Calif. 94062 3,647,280 3/1972 Klein et al. 350/160 R
 3,720,623 3/1973 Cartmeil et al. 23/230 LC
- [22] Filed: Oct. 14, 1971
- [21] Appl. No.: 189,138
- [52] U.S. Cl. 161/5, 23/230 LC, 40/28 R,
 161/6, 161/139, 161/DIG. 5, 161/410,
 252/408, 350/160 R
- [51] Int. Cl. B44F 9/08, B01J 13/02
- [58] Field of Search 252/408; 161/1, 3.5, 5,
 161/6, 139, DIG. 1, DIG. 5, 408-410;
 350/160 LC; 23/230 LC; 40/28 C, 28 R
- [56] **References Cited**
 UNITED STATES PATENTS
 3,585,381 6/1971 Hodson et al. 161/410 X
- [57] **ABSTRACT**
 A novelty device which utilizes the iridescent qualities of liquid crystalline material to effect variations in colorations of the device upon application of different temperatures.
- 7 Claims, 9 Drawing Figures**



PATENTED APR 9 1974

3,802,945

SHEET 1 OF 2

FIG. 1.



FIG. 2.

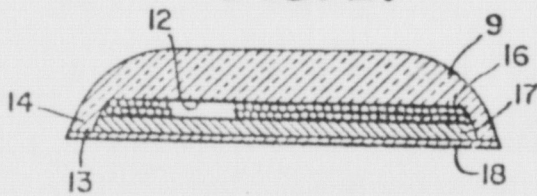


FIG. 3.



FIG. 4.

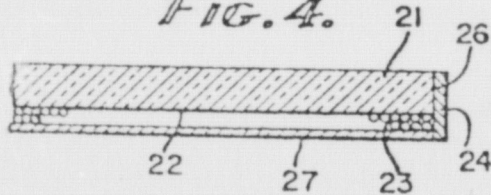


FIG. 5.

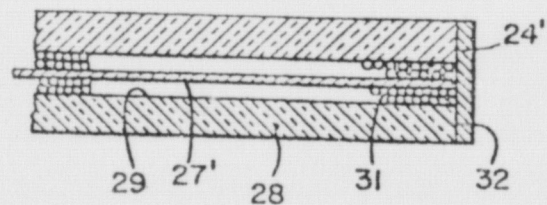
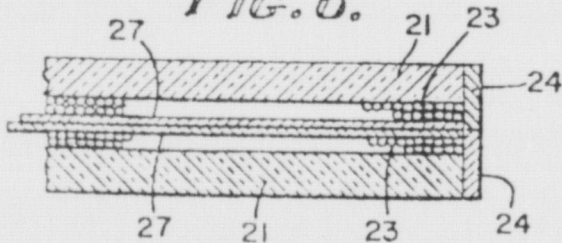


FIG. 6.

INVENTOR.
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PATENTED APR 9 1974

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SHEET 2 OF 2

FIG. 7.

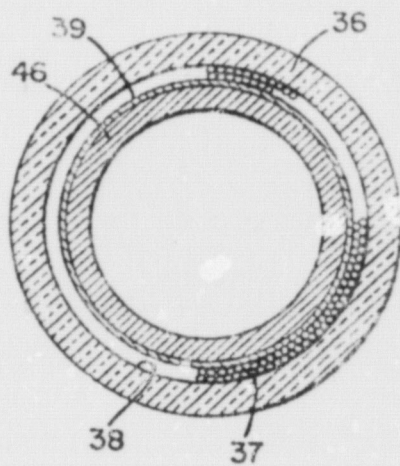


FIG. 8.

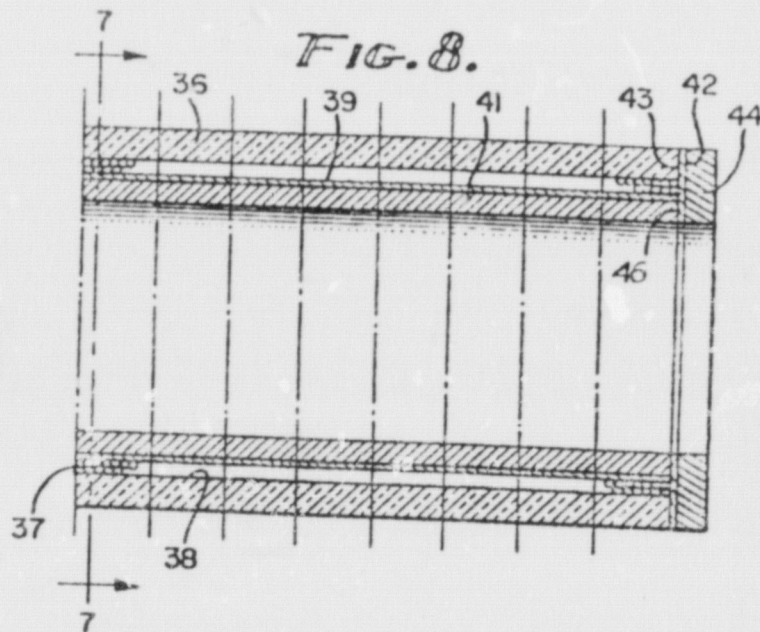
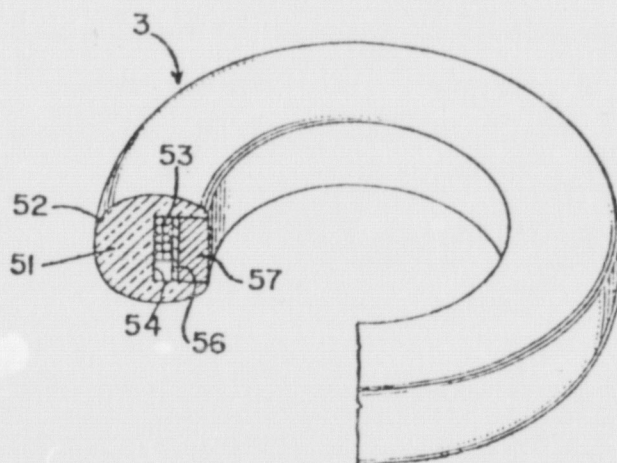


FIG. 9.

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HEAT SENSITIVE NOVELTY DEVICE

BACKGROUND OF THE INVENTION

This invention relates to novelty devices fabricated from transparent synthetic resinous materials in combination with crystalline liquids such as those described in U.S. Pat. No. 3,524,726 and British Patents 1,138,590 and 1,161,039. These patents each teach the characteristic of crystalline liquids of various types, sensitive to various temperatures, to provide iridescence in the crystalline liquid, such iridescence being useful for several different purposes. As indicated in British Patent 1,138,590, the usefulness of cholesteric mesomorphs in temperature-sensitive systems has been severely limited due largely to the fact that these crystalline liquids had not theretofore been isolated. This patent teaches a method by which tiny droplets of crystalline liquids, described in this patent as thermotropic liquids, are isolated and protected as the cores of minute transparent walled capsules, and the subsequent distribution of these capsules in a thin film layer on a suitable substrate, preferably sensitive to temperature variations. The wall of the capsule which contains the liquid nucleus of crystalline liquid material is transparent, i.e., transmits light incident upon and reflected from the capsule contents. It has been found that many of the disadvantages inherent in the use of these mesomorphic compound film layers in the wet state disappear when used in the form of tiny encapsulated droplets.

Although each of the tiny droplets is itself encapsulated, it has been found through tests and experimentation that such encapsulated droplets are still subject to destruction by contact with various solvents, excessive heat, and physical abrasion. Accordingly, it is one of the principal objects of the present invention either to encapsulate a multiplicity of such encapsulated droplets, in strip form for use in the ultimate product, or to encapsulate a quantity of the encapsulated droplets by the formation of the end product itself.

It has been found that additional encapsulation of the encapsulated droplets of crystalline material can be effected in such a way that the finished product may be used for many different purposes, for instance, as the setting for a ring, a pendant, a tie clasp, or a tie pin. Accordingly, it is one of the objects of the invention to encapsulate encapsulated droplets of a crystalline liquid in such a way that variations in color in response to variations in temperature will be visible through the body of transparent material in which the encapsulated droplets are in turn encapsulated.

The invention possesses other objects and features of advantage, some of which with the foregoing, will be apparent from the following description of the drawings. It is to be understood, however, that the invention is not limited to the embodiments illustrated and described, as it may be embodied in various forms within the scope of the appended claims.

SUMMARY OF THE INVENTION

In terms of broad inclusion, the invention comprises the further encapsulation of the encapsulated droplets of crystalline material within a transparent body in such a way that the individually encapsulated droplets of crystalline material will still be responsive to variations in temperature to effect iridescence thereof, and so

that the iridescence so formed will be visible to the observer through a transparent body which effectively seals the encapsulated droplets of crystalline material from the ambient atmosphere while permitting transmission of light therethrough.

To this end, in one aspect of the invention, a hollow body of polyester, acrylic or other synthetic resinous transparent material is formed so as to receive there-within a quantity of the encapsulated droplets of crystalline material, either in unoriented bulk form, or in the form of oriented layers of such encapsulated droplets of crystalline material arranged in strip form. In either case, the quantity of encapsulated droplets of crystalline material is sealed within the recess of the hollow transparent body by a thin layer of polyester, acrylic or other resin, which may or may not be opaque, or some other material, through which heat may be readily transmitted for absorption by the crystalline material.

In another aspect of the invention, the individual beads or droplets of encapsulated crystalline material are applied directly to one side of a flat transparent sheet in the nature of a laminate and to which transparent sheet they are sealed by any appropriate means. In still another aspect of the invention, the flat transparent sheet laminated as described, is further laminated with a like structure so that both sides of the panel constitute transparent surfaces, with the quantity of encapsulated crystalline liquid material being sealed between the two panes of transparent material.

In yet another embodiment of the invention, the transparent body is tubular in conformation and the inner periphery of the tubular body is used as a carrier for the layer or layers of crystalline liquid material encapsulated in individual capsules. Such encapsulated droplets may be sealed to the inner periphery of the transparent tubular body by any appropriate means such as a second tube concentrically disposed there-within. The second tube may be either opaque or transparent, or may be transparent with an opaque layer on its outer periphery. In either case, the ends of the tubular body are sealed so that the encapsulated crystalline liquid material is isolated from the ambient atmosphere, yet may be subjected to the transmission of heat thereto through the inner periphery of the tubular body.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a composite view illustrating use of the invention as the setting for a ring, a bracelet, a pendant, earrings, a tie clasp, and a tie pin.

FIG. 2 is a vertical cross-sectional view through one embodiment of the invention in which the encapsulated crystalline liquid droplets are mounted on a suitable substrate and sealed within a hollow formed in a transparent body.

FIG. 3 is a view similar to FIG. 2, but showing the encapsulated crystalline liquid material filling the recess within a transparent body in the absence of a substrate, and being sealed therein by an appropriate means.

FIG. 4 is a cross-sectional view illustrating a second embodiment in which the encapsulated crystalline liquid material is sealed on one side of a flat transparent sheet.

FIG. 5 is a view similar to FIG. 4, but illustrating formation of a double-faced panel, the separate faces of which are transparent, with the encapsulated crystal-

line liquid material sealed between an intermediary opaque backing member and each associated transparent panel.

FIG. 6 is a vertical cross-sectional view similar to FIG. 4, but showing a lamination of two such members in back-to-back relationship so that opposite faces of the composite panel are transparent.

FIG. 7 is a vertical cross-sectional view taken in the plane indicated by the line 7-7 in FIG. 8, and illustrates an embodiment of the invention in conjunction with a tubular transparent body.

FIG. 8 is a vertical cross-sectional view taken along the axis of a tubular transparent body, showing the encapsulated crystalline liquid material forming a layer bonded to the inner peripheral surface of the transparent tubular body.

FIG. 9 illustrates formation of a tubular or toroidal body in the form of a bracelet with the encapsulated crystalline liquid material being bonded to the inner periphery thereof and sealed so as to be isolated from the ambient atmosphere, while placing the encapsulated crystalline liquid material in close proximity to the wearer's body so that body heat may be conducted to the material to effect iridescence thereof.

DESCRIPTION OF THE PREFERRED EMBODIMENT

In terms of greater detail, as explained in the two British patents noted above, one of the problems in connection with mesomorphic cholesterol derivatives in the form of crystalline liquid materials, subject to iridescence through various colors of the spectrum upon application of various temperatures, has been the problem of finding some utility for such crystalline liquid materials. Accordingly, it should be understood in connection with the subject invention that no claim is herein made to the method of effecting polymeric encapsulation of the individual crystalline liquid droplets as disclosed and taught by British Patent 1,138,590, nor is any claim made herein to the use of such cholesteric mesomorphic (liquid crystal) materials in an emulsion of unencapsulated cholesteric mesomorphic material disbursed in a matrix like polymeric binder material as taught in British Patent 1,161,039. Rather, it is the purpose of this invention to describe and claim the utilization in novel combinations to produce novel products of individually encapsulated droplets of temperature-sensitive liquid crystalline material by further encapsulating such encapsulated droplets within a transparent body to form a novel product not heretofore available. It is within the contemplation of this invention that such further encapsulation of encapsulated crystalline liquid droplets may take the form of a laminate in which the encapsulated crystalline liquid droplets are deposited within any preformed hollow transparent body, or it may be carried out by the direct admixture of encapsulated droplets of crystalline liquid material with a liquid polyester, acrylic or other transparent resin in liquid form so that the encapsulated beads of crystalline liquid material are suspended within the liquid phase of the polyester, acrylic or other resin and dispersed throughout such transparent material.

Referring to FIG. 1, in the composite view there shown, to the left thereof, there is illustrated the embodiment of the subject invention as the setting 2 for a ring, or the visible portion 3 of a bracelet. In another

form, the invention may be embodied as the setting 4 of a pendant to be worn around the neck, or as the setting 6 for earrings. For men, it is feasible that the invention may be embodied in such useful items as a tie pin 7 or a tie clasp 8.

Embodiment of the invention in different forms is exemplified in FIGS. 2 through 9. Referring specifically to FIG. 2, there is there shown a body 9 of transparent material, conveniently polyester, acrylic or other resin, or a cast transparent material such as glass. The body 9 is formed with a recess defined by the inner surface 12 depressed below the level 13 of a peripheral flange 14. Within the recess thus defined, there is deposited one or more layers 16 of closely spaced encapsulated droplets of crystalline liquid material conveniently caused to adhere to a substrate 17 by any suitable means such as described in British Patent 1,138,590. The substrate, for instance, may be a metal foil, or a non-metal material on one surface of which the encapsulated droplets of crystalline liquid material are caused to adhere to form a cohesive film.

The film thus formed, may be a single layer of encapsulated crystalline liquid droplets, or may be a plurality or multiplicity of layers, with the encapsulated droplets of each of the layers being responsive to different temperatures to produce different color effects. In FIG. 2, there is illustrated a film 16 supported on a substrate 17, with the film being two layers thick. As there shown, the substrate-supported film of encapsulated crystalline liquid droplets are sealed within the recess formed within the transparent body 9 by sealing member 18, preferably adherent to the opposite side of the substrate 17 from the encapsulated crystalline liquid droplets, and adherent also to the peripheral edge 13 of the flange 14. In this way, the encapsulated crystalline droplets are completely sealed from the ambient atmosphere, and yet are in direct thermodynamic relationship to the substrate 17 and the sealing member 18, so that any variation in temperature may be conducted through the sealing member 18 and substrate 17 to produce iridescence of the encapsulated crystalline liquid material. It will, of course, be apparent that the sealing member 18 may be a metallic or non-metallic member, the requirement being that it form a substantially hermetic seal with the peripheral edge 13 of the flange 14.

Referring to FIG. 3, there is there shown a structure similar to the structure illustrated in FIG. 2, but in which the substrate 17 has been omitted. In this instance, the recess formed within the body 9 is essentially filled with individually encapsulated droplets of the crystalline liquid material which may be in layer form as illustrated in FIG. 3, or which may be indiscriminately oriented one to the other, (i.e., unoriented) within the recess and then sealed therein by the sealing member 18, which again effects a substantially hermetic seal around the peripheral edge 13 of the flange 14 of the transparent body. The advantage of this construction is that the encapsulated droplets of crystalline liquid material may be purchased in bulk form and simply deposited within the recess within the transparent body 9. It will, of course, be obvious that the recess may be of any configuration so that a variation of effects may be visible through the transparent body within which the iridescent droplets of encapsulated crystalline liquid material are sealed.

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While FIGS. 2 and 3 are cross-sectional views showing the relationship between the thickness of the transparent body 9 and the disposition of the encapsulated droplets of crystalline liquid material therewithin, it is apparent that the configuration of the body itself in a direction perpendicular to FIGS. 2 and 3 may be of any configuration. For instance, it is contemplated that such transparent body may be ovate, circular, or rectangular, or any other appropriate configuration consistent with the use to which the device when completed will be applied.

It is important also to note that with respect to the conduction of heat to the encapsulated droplets of crystalline liquid material, such thermoconduction progresses more readily through the sealing member 18 and substrate 17, as illustrated in FIG. 2, or directly through the sealing member 18 into the encapsulated droplets directly as indicated in FIG. 3. Transmission of heat energy through the transparent body 9 is in general slower than transmission of heat energy through the opposite side of the device. In general, it may be said that the transparent body 9 functions to conduct light energy as opposed to heat energy. Thus, while heat energy is utilized to effect iridescence of the encapsulated crystalline liquid material, the transmission of light through the body 9 is effective to permit such iridescence to be visible to the naked eye and thus make this quality of iridescence of practical use with respect to novelty devices of this type.

Referring to FIG. 4, the embodiment there shown utilizes a flat transparent face plate or panel 21 against one surface 22 of which a single or multiplicity of layers of encapsulated droplets 23 of a crystalline liquid material are arranged, either indiscriminately oriented, or in layer form as indicated. In this instance, the flat transparent face panel 21 is provided with a peripheral sealing band 24 hermetically sealed by any appropriate means to the edge 26 of the panel 21, and cooperating with a sealing member 27 disposed substantially parallel to the transparent panel and effective to confine the encapsulated droplets of crystalline liquid material in tight contiguous relationship to the surface 22 of the transparent panel.

As with the embodiments illustrated in FIGS. 2 and 3, the sealing member 27 may be metallic or non-metallic, the criterion being that it seal the encapsulated droplets of crystalline liquid material from the ambient atmosphere. In most instances, it is preferable that the sealing member 27 be metallic because of its advantageous thermoconduction characteristics, and also because a metallic sealing member is opaque. Thus, light transmitted through the transparent panel and striking the iridescent droplets of crystalline material will be reflected back through the transparent panel for observation.

In this regard, the peripheral seal flange 24 may be transparent or non-transparent, may be metal or non-metal, but should be compatible in its thermal expansion and contraction characteristics with the panel 21 and seal member 27, to both of which it is secured. In a preferred method of fabrication, if the transparent panel is one of the transparent synthetic resins, such as polyester or acrylic resins, it is preferred that the seal flange 24 also be fabricated from one of these materials. Where the transparent panel is fabricated from glass, the seal flange 24 may likewise be fabricated from glass, but if fabricated from metal, the nature of

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the union between the edge 26 of the transparent panel and the metallic seal flange 24, including the cross-sectional thickness of the seal flange 24, should be gauged so that there is little or no stress in the union between these two members due to thermal expansion and contraction thereof.

The embodiment of the invention illustrated in FIG. 5 is an expansion of the concept illustrated in FIG. 4. In this embodiment, a second panel 28 has been added to the ordinarily exposed side of the seal member 27', and an additional layer or layers or quantity of indiscriminately oriented individually encapsulated droplets of crystalline material 31 are disposed between the additional transparent panel 28 and the member 27' in the recess 29 in the recess formed therebetween. In this instance, the peripheral seal flange 24' is extended to overlap the peripheral edge 32 of transparent panel 28 so as to completely close the void or recess between the two transparent panels 21 and 28.

It will thus be seen that in this construction the member 27' does not act so much as a sealing member as it does a supporting or backing member for the encapsulated droplets disposed on each side thereof. Additionally, where the member 27' is opaque, as it would be if fabricated from metal, the member 27' performs the function of reflecting light passing through each of the transparent panels 21 and 28 so that the iridescent quality of the encapsulated droplets of crystalline liquid material may be visible through each of the transparent plates.

In this embodiment, it is preferable that the sealing flange 24' be fabricated from a highly thermally conductive metallic material as opposed to a non-metallic material having less thermal conductivity, so that thermal energy absorbed by the sealing flange 24' may be conducted directly to the peripheral edge of the intermediate member 27' and from this intermediate member to the contiguous encapsulated droplets of crystalline liquid material. It will thus be seen that iridescence through variations in color will commence initially in the peripheral margins of the device and gradually diffuse in vari-colored fashion through the entire expanse of the panel.

FIG. 6 illustrates an embodiment which constitutes a lamination of two of the units illustrated in FIG. 4. In the interest of brevity, corresponding reference numbers have been applied to corresponding elements of the combination. It should be noted however, that in this instance, as illustrated in FIG. 6, the sealing flange 24 is preferably fabricated from a metallic material which forms a close bond with the peripheral edge of the intermediate sealing member 27 so that there may be an efficient conduction of thermal energy from the peripheral flange 24 to the associated member 27. In this embodiment, the member 27 in each instance performs a sealing function, with the adjacent members 27 merely being secured one to the other through an appropriate adhesive.

In the embodiment of the invention illustrated in FIGS. 7 and 8, the transparent body 36 constitutes a tubular member, preferably cylindrical in form, and one or more layers 37 of separately encapsulated droplets of crystalline liquid material are disposed contiguous to the inner peripheral surface 38 of the transparent tubular body. As previously discussed, the encapsulated droplets may be in film form, supported by an appropriate backing member 39, which may be a flexible non-

metallic synthetic resinous material such as a polyester or acrylic resin, or a metallic foil on which the encapsulated droplets of crystalline liquid material are deposited to form a film.

This film may be caused to adhere to the inner periphery of the tubular transparent body 36 so that in effect the layer or layers of encapsulated droplets, together with the foil 39 on which they are supported, constitute a lamination bonded to the inner periphery of the tubular transparent body. In another aspect of this invention, the member 39 may be additionally supported by inserting a support member 41 therewithin. The support member 41 may be transparent or non-transparent, may be metallic or non-metallic and where transparent, it is preferable that the member 39 be opaque so as to increase the efficiency with which the light passing through the body 36 and striking the iridescent encapsulated droplets of crystalline liquid material, is reflected back through the transparent tubular body for observation.

As in the previous embodiments, the encapsulated droplets of crystalline liquid material are preferably isolated from the ambient by an appropriate seal member 42 secured across the end edge 43 of the tubular transparent body. Additional support is given the sealing member 42 by a reinforcing member 44. Preferably, the sealing member 42 is also sealingly engaged to the end edge 46 of the inner tubular support member 41 where such support member is used. In terms of utility, such a tubular construction may be useful in a water system, for instance, where it is desirable to monitor the temperature of the water.

Thus, where the inner tubular support member 41 constitutes a hot water conduit, heat from this member will be conducted directly to the foil 39 and thence to the iridescent encapsulated droplets of crystalline liquid material. The degree of thermal energy thus conducted will be apparent to an observer, the color seen by the observer being an indication of the temperature of the liquid passing through the inner conduit 41. In this respect, it will of course be understood, different compositions of crystalline liquid material will produce different colors at various temperatures so that any desirable or convenient combination of colors may be utilized to signify different conditions or temperatures of the water passing through the inner conduit 41.

In another aspect of this invention, and relating primarily to novelty devices as opposed to industrial utilization of the invention, FIG. 9 illustrates a bracelet construction designated generally by the numeral 3, to be worn in the manner indicated in FIG. 1. In this construction, the transparent body 51 is generally toroidal in configuration, the outer peripheral surface 52 being generally circular or ovate in cross section so as to produce a lens effect to magnify the iridescent quality of the separately encapsulated droplets of a crystalline liquid material 53 confined within a recess 54 formed in the inner periphery of the toroidal body.

As indicated heretofore, the encapsulated droplets of crystalline liquid material may be appropriately mounted on a suitable film or foil 56, which may be cut in strip form so as to be accommodated within the recess 54 as shown. For additional support, and to provide direct conduction of thermal energy from the wrist of the person wearing the bracelet, and additionally to render the inner periphery of the bracelet smooth and contribute to the esthetic appeal of the bracelet, a support

band 57 is preferably disposed concentrically within the inner periphery of the support film or foil 56 and caused to adhere at its lateral edges to the associated sides of the recess adjacent the inner periphery of the bracelet. In this way, the encapsulated droplets of crystalline material lie confined and hermetically isolated from the ambient atmosphere within the transparent body of the bracelet, where they may be easily subjected to variations in thermal energy so as to produce variations in color responsive to such variations in temperature.

From the foregoing, it will be apparent that the invention may be embodied in many different forms to provide devices of both novelty and industrial application. It should especially be noted that shapes do not limit the uses to which the encapsulated droplets of crystalline liquid material may be put, the concept of further encapsulation of the encapsulated droplets of crystalline material being applicable in many different embodiments within the scope of the appended claims.

Having thus described my invention, what is claimed to be novel and sought to be protected by letters patent is as follows:

1. As an article of manufacture, the combination comprising:

- a. a transparent body;
- b. a multiplicity of separately encapsulated droplets of a crystalline liquid encapsulated in turn within said transparent body, said droplets of separately encapsulated crystalline liquid iridescent when subjected to varying temperatures to display through said transparent body varying colors correlated to said varying temperatures;
- c. said transparent body being generally flat and having a peripheral flange defining a recess within said body, said multiplicity of separately encapsulated droplets of crystalline liquid being deposited within said recess; and
- d. means for sealing said recess whereby said encapsulated droplets of crystalline liquid are sealed within the recess of said transparent body.

2. The combination according to claim 1, in which said means sealing said recess comprises a hardened mass cast in said recess and adherent to said transparent body and to said multiplicity of encapsulated droplets of crystalline liquid.

3. As an article of manufacture, the combination comprising:

- a. a transparent body;
- b. a multiplicity of separately encapsulated droplets of a crystalline liquid encapsulated in turn within said transparent body, said droplets of separately encapsulated crystalline liquid iridescent when subjected to varying temperatures to display through said transparent body varying colors correlated to said varying temperatures;
- c. said transparent body being generally flat and having a recess therewithin, said encapsulated droplets of crystalline liquid being disposed in self-supporting film form and deposited in said recess; and
- d. means superimposed over the film of encapsulated droplets of crystalline liquid to support said film and seal said recess.

4. As an article of manufacture, the combination comprising:

- a. a transparent body;
- b. a multiplicity of separately encapsulated droplets of a crystalline liquid encapsulated in turn within said transparent body, said droplets of separately encapsulated crystalline liquid iridescent when subjected to varying temperatures to display through said transparent body varying colors correlated to said varying temperatures;
- c. said transparent body being tubular in form and having inner and outer peripheral surfaces, said encapsulated droplets of crystalline liquid being disposed in a layer adjacent the inner peripheral surface of said tubular transparent body; and
- d. means superimposed over the layer of encapsulated droplets of crystalline liquid to seal the encapsulated droplets against the inner peripheral surface of the tubular transparent body.
5. The combination according to claim 4, in which said means superimposed over said layer of encapsulated droplets of crystalline material comprises a tubular member.
6. As an article of manufacture, the combination comprising:
- a. a transparent body;
- b. a multiplicity of separately encapsulated droplets of a crystalline liquid encapsulated in turn within said transparent body, said droplets of separately encapsulated crystalline liquid iridescent when subjected to varying temperatures to display through said transparent body varying colors correlated to said varying temperatures;
- c. said transparent body comprising a flat sheet, said encapsulated droplets of crystalline liquid are disposed in a layer on one surface of said flat transparent sheet;
- d. a flat opaque backing member superimposed coextensively over said layer of encapsulated droplets;
- e. means sealing marginal edge portions of said flat opaque backing member to said flat transparent sheet to enclose and support said encapsulated droplets between said flat transparent sheet and the

- flat backing member;
- f. a second layer of encapsulated droplets of crystalline liquid disposed on the other side of said flat opaque backing member from said first layer of encapsulated droplets of crystalline liquid; and
- g. a second transparent flat sheet disposed over said second layer of encapsulated droplets of crystalline liquid material, said marginal sealing means sealing marginal edges of both said transparent sheets and the intervening flat opaque backing member.
7. As an article of manufacture, the combination comprising:
- a. a transparent body;
- b. a multiplicity of separately encapsulated droplets of a crystalline liquid encapsulated in turn within said transparent body, said droplets of separately encapsulated crystalline liquid iridescent when subjected to varying temperatures to display through said transparent body varying colors correlated to said varying temperatures;
- c. said transparent body comprising a flat sheet, said encapsulated droplets of crystalline liquid are disposed in a layer on one surface of said flat transparent sheet;
- d. a flat opaque backing member superimposed coextensively over said layer of encapsulated droplets;
- e. means sealing marginal edge portions of said flat opaque backing member to said flat transparent sheet to enclose and support said encapsulated droplets between said flat transparent sheet and the flat backing member;
- f. a second assembly including a transparent flat sheet, a layer of encapsulated droplets of crystalline liquid, and a flat opaque backing member mounted on said first assembly, said flat opaque backing members lying in close juxtaposed relation; and
- g. adhesive means securing said backing members to each other.
- * * * * *

PLAINTIFFS' EXHIBIT 2.

189188 SERIAL NO. (Class of 1970)	PATENT DATE APR 9 1974	PATENT NUMBER 3802945
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SERIAL NUMBER 189,188	FILING DATE 10/14/71	CLASS 1161	SUBCLASS 5	GROUP ART UNIT 1164	ASSISTANT EXAMINER Anchor
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APPLICANT
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1875 Cordillera Road, 94062

TITLE OF INVENTION
HEAT SENSITIVE NOVELTY DEVICE

SEND CORRESPONDENCE TO
**JOHN J. LEAVITT,
777 NORTH FIRST ST.
SAN JOSE, CALIF. 95112**

PRINCIPAL ATTORNEY
JOHN J. LEAVITT,

ASSOCIATE ATTORNEY
NONE



SER. NO. 189,188	STATE OR COUNTRY (C)	SHEETS DRAWINGS 12	TOTAL CLAIMS 13	INDEP. CLAIMS 1	FILING FEE RECEIVED \$71	ATTORNEY'S DOCKET NO. 1719	CLAIMS ALLOWED 7/16/75	CLASS 1161/5	SUBCLASS 5
CONTINUING DATA NONE		VERIFIED EXAMINER'S INITIALS Aa							

CLAIMS PRIORITY FOREIGN APPLICATION
NONE

MEETS CONDITIONS SPECIFIED IN 35 USC 119 YES ☐ NO ☐

Note:
Page 2
is missing from amendment
dated May 11, 1973.

PARTS OF APPLICATION FILED SEPARATELY		PREPARED FOR ISSUE 9-25-77	
 [THIS SPACE RESERVED FOR RETENTION LABEL]		(Assistant Examiner) MB Bailey (Docket Clerk)	
		EXAMINED AND PASSED FOR ISSUE	
8593 029 [THIS SPACE RESERVED] <i>Sheet 2 Page 9</i>		HEROLD ANCHER 11 164 (Primary Examiner) (Art Unit)	
[THIS SPACE RESERVED] Drawing(s) Bif Spec(s) \$1114		Notice of allowance and issue fee due for 11/14/77 Date mailed Oct 22 1977 Date paid	

160188
SERIAL NO. (Since 1970)

SERIAL NUMBER

160,188

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PLAINTIFFS' EXHIBIT 2

SEARCHED

Class	Sub	Date	Ex'r
252	408	1/26/73	Ha
161	1,3.5		
	5,6		
	139		
	408 to		
	410		
350	160LC		
23	230LC		
40	28C + R		
252			
161	above	7/5/73	Ha
350	sub		
23			
40			
252			
161	above	9/14/73	Ha
350	sub		
23			
40			

INTERFERENCE SEARCHED

Class	Sub	Date	Ex'r
161	1,3.5	9/14/73	Ha
	5,6		
	139		
	408-410		
350	160		
23	230		
40	28		
252	408		

INDEX OF CLAIMS

Class	Date	Class	Date
Final	Original	Final	Original
1		26	
2		27	
3		28	
4		29	
5		30	
6		31	
7		32	
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11		36	
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14		39	
15		40	
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18		43	
19		44	
20		45	
21		46	
22		47	
23		48	
24		49	
25		50	

SYMBOLS STATUS

✓ Rejected

• Allowed

— (Through measure?) Cancelled

• Restriction requirement

N Nonrelated invention or species

I Interference

A Appeal

O Objected

189188
RECEIVED

MAR 7 1972

GROUP 170

PLAINTIFFS' EXHIBIT 2

CONTENTS

1. Application ^{2 print} papers.
2. *Exhibit 1* Federal Indictment
3. *Amend. B* May 18, 1973
4. *Exhibit 2* May 18, 1973
5. *Exhibit 3* May 29, 1973
6. *Exhibit 4* July 13, 1973
7. *Amend. B* Aug 29, 1973
8. *Notice of Appeal* Oct 17, 1973
9. *Exhibit 5* C. Sup. 27, 1973
10. _____
11. _____
12. _____
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36. _____

END TO 18612.01
SEP 27 1973
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GROUP 160

PLAINTIFFS' EXHIBIT 2

SN 189,188

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FIG. 1.



FIG. 2.

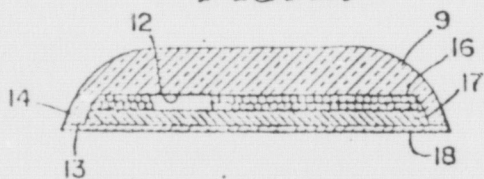


FIG. 3.

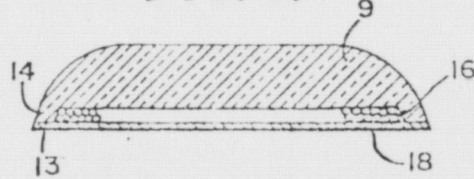


FIG. 4.

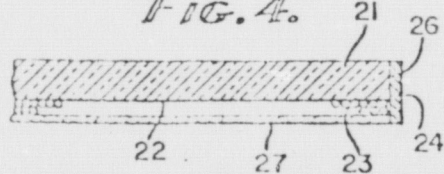


FIG. 5.

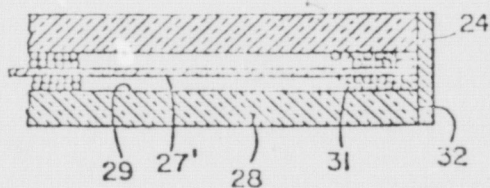
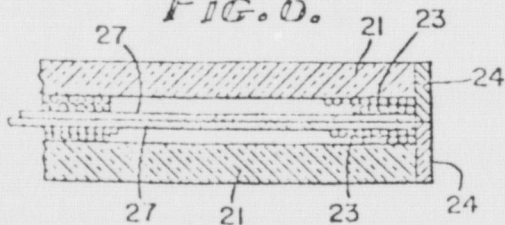


FIG. 6.

INVENTOR
BILL G. JAMES

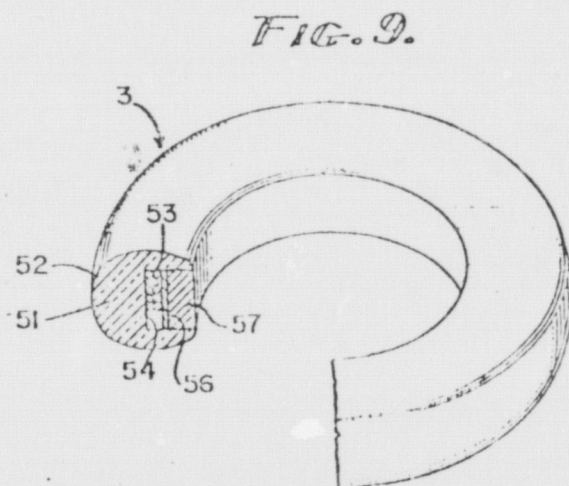
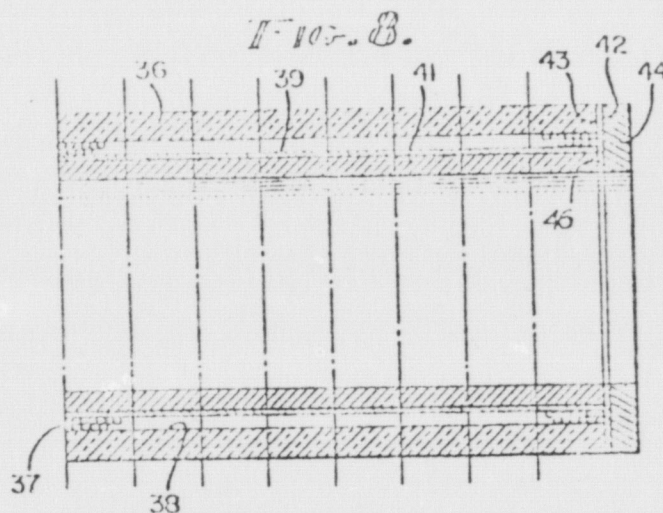
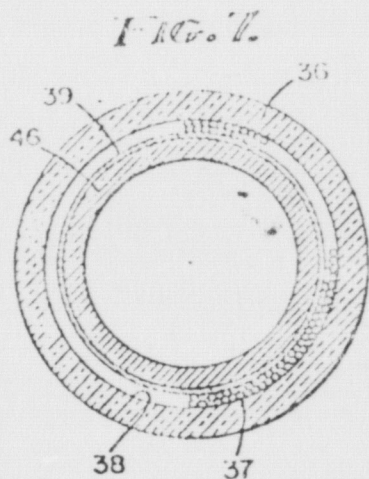
BY

John F. Hewitt

PLAINTIFFS' EXHIBIT 2

25/189/88

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INVENTOR
 BILL G. JAMES

BY

John J. Leavitt

PLAINTIFFS' EXHIBIT 2

OCT 14 1971

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189188

BILL G. JAMES, INVENTOR

CCI-22-71 55746 B 151-CA

HEAT SENSITIVE NOVELTY DEVICEABSTRACT OF THE DISCLOSURE

CCI-22-71 55746 B 151-CA

Presented is a novelty device wh
 iridescent qualities of liquid *crystalline* mat *effect*
 variations in colorations of the device upon application of
 different temperatures.

BACKGROUND OF THE INVENTION

This invention relates to novelty devices fabricated from transparent synthetic resinous materials in combination with *crystalline* liquids such as those described in United States Patent 3,524,726 and British Patents 1,138,590 and 1,161,039. These patents each teach the characteristic of *crystalline* liquids of various types, sensitive to various temperatures, to provide iridescence in the *crystalline* liquid, such iridescence being useful for several different purposes.

As indicated in British Patent 1,138,590, the usefulness of cholesteric mesomorphs in temperature-sensitive systems has been severely limited due largely to the fact that these *crystalline* liquids had not theretofore been isolated. This patent teaches a method by which tiny droplets of *crystalline* liquids, described in this patent as thermotropic liquids, are isolated and protected as the cores of minute transparent walled capsules, and the subsequent distribution of these capsules in a thin film layer on a suitable substrate, preferably sensitive to temperature variations. The wall of the capsule which contains the liquid nucleus of *crystalline* liquid material is transparent, i.e., transmits light incident upon and reflected from the capsule contents. It has been found that many of the disadvantages inherent in the use of these

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mesomorphic compound film layers in the wet state disappear when used in the form of tiny encapsulated droplets.

Although each of the tiny droplets is itself encapsulated, it has been found through tests and experimentation that such encapsulated droplets are still subject to destruction by contact with various solvents, excessive heat, and physical abrasion. Accordingly, it is one of the principal objects of the present invention ^{either} to encapsulate a multiplicity of such encapsulated droplets, ~~either~~ in strip form for use in the ultimate product, or ^{to} encapsulate a quantity of the encapsulated droplets by the formation of the end product itself.

It has been found that additional encapsulation of the encapsulated droplets of crystalline material can be effected in such a way that the finished product may be used for many different purposes, for instance, as the setting for a ring, a pendant, a tie clasp, or a tie pin. Accordingly, it is one of the objects of the invention to encapsulate encapsulated droplets of a ^{crystalline} ~~crystalline~~ liquid in such a way that variations in color in response to variations in temperature will be visible through the body of transparent material in which the encapsulated droplets are in turn encapsulated.

The invention possesses other objects and features of advantage, some of which with the foregoing, will be apparent from the following description of the drawings. It is to be understood, however, that the invention is not limited to the embodiments illustrated and described, as it may be embodied in various forms within the scope of the appended claims.

SUMMARY OF THE INVENTION

In terms of broad inclusion, the invention comprises

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the further encapsulation of the encapsulated droplets of ~~crystalline~~ *crystalline* material within a transparent body in such a way that the individually encapsulated droplets of ~~crystalline~~ *crystalline* material will still be responsive to variations in temperature to effect iridescence thereof, and so that the iridescence so formed will be visible to the observer through a transparent body which effectively seals the encapsulated droplets of ~~crystalline~~ *crystalline* material from the ambient atmosphere while permitting transmission of light therethrough.

To this end, in one aspect of the invention, a hollow body of polyester, acrylic or other synthetic resinous transparent material is formed so as to receive therewithin a quantity of the encapsulated droplets of ~~crystalline~~ *crystalline* material, either in unoriented bulk form, or in the form of oriented layers of such encapsulated droplets of ~~crystalline~~ *crystalline* material arranged in strip form. In either case, the quantity of encapsulated droplets of ~~crystalline~~ *crystalline* material is sealed within the recess of the hollow transparent body by a thin layer of polyester, acrylic or other resin, which may or may not be opaque, or some other material, through which heat may be readily transmitted for absorption by the ~~crystalline~~ *crystalline* material.

In another aspect of the invention, the individual beads or droplets of encapsulated ~~crystalline~~ *crystalline* material are applied directly to one side of a flat transparent sheet in the nature of a laminate and to which transparent sheet they are sealed by any appropriate means. In still another aspect of the invention, the flat transparent sheet laminated as described, is further laminated with a like structure so that both sides of the panel constitute transparent surfaces, with the quantity of encapsulated ~~crystalline~~ *crystalline* liquid material being sealed between the two ~~lights~~ *lights* or panes of transparent material.

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In yet another embodiment of the invention, the transparent body is tubular in conformation and the inner periphery of the tubular body is used as a carrier for the layer or layers of ~~crystalline~~ ^{crystalline} liquid material encapsulated in individual capsules. Such encapsulated droplets may be sealed to the inner periphery of the transparent tubular body by any appropriate means such as a second tube concentrically disposed therewithin. The second tube may be either opaque or transparent, or may be transparent with an opaque layer on its outer periphery. In either case, the ends of the tubular body are sealed so that the encapsulated ~~crystalline~~ ^{crystalline} liquid material is isolated from the ambient atmosphere, yet may be subjected to the transmission of heat thereto through the inner periphery of the tubular body.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a composite view illustrating use of the invention as the setting for a ring, a bracelet, a pendant, earrings, a tie clasp, and a tie pin.

FIG. 2 is a vertical cross-sectional view through one embodiment of the invention in which the encapsulated ~~crystalline~~ ^{crystalline} liquid droplets are mounted on a suitable substrate and sealed within a hollow formed in a transparent body.

FIG. 3 is a view similar to FIG. 2, but showing the encapsulated ~~crystalline~~ ^{crystalline} liquid material filling the recess within a transparent body in the absence of a substrate, and being sealed therein by an appropriate means.

FIG. 4 is a cross-sectional view illustrating a second embodiment in which the encapsulated ~~crystalline~~ ^{crystalline} liquid material is sealed on one side of a flat transparent sheet.

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FIG. 5 is a view similar to FIG. 4, but illustrating formation of a double-faced panel, the separate faces of which are transparent, with the encapsulated ~~crystalline~~ ^{crystalline} liquid material sealed between an intermediary opaque backing member and each associated transparent flat panel.

FIG. 6 is a vertical cross-sectional view similar to FIG. 4, but showing a lamination of two such members in back-to-back relationship so that opposite faces of the composite panel are transparent.

FIG. 7 is a vertical cross-sectional view taken in the plane indicated by the line 7-7 in FIG. 8, and illustrates ^{an} embodiment of the invention in conjunction with a tubular transparent body.

FIG. 8 is a vertical cross-sectional view taken along the axis of a tubular transparent body, showing the encapsulated ~~crystalline~~ ^{crystalline} liquid material forming a layer bonded to the inner peripheral surface of the transparent tubular body.

FIG. 9 illustrates formation of a tubular or toroidal body in the form of a bracelet with the encapsulated ~~crystalline~~ ^{crystalline} liquid material being bonded to the inner periphery thereof and sealed so as to be isolated from the ambient atmosphere, while placing the encapsulated ~~crystalline~~ ^{crystalline} liquid material in close proximity to the wearer's body so that body heat may be conducted to the material to effect iridescence thereof.

DESCRIPTION OF THE PREFERRED EMBODIMENT

In terms of greater detail, as explained in the two British patents ^{noted} ~~illustrated~~ above, one of the problems in

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connection with mesomorphic cholesterol ^{derivatives} ~~derivatives~~ in the
 form of ^{crystalline} ~~crystalline~~ liquid materials, subject to iridescence
 through various colors of the spectrum upon application of
 various temperatures, has been the problem of finding some
 utility for such ^{crystalline} ~~crystalline~~ liquid materials. Accordingly,
 it should be understood in connection with the subject inven-
 tion that no claim is herein made to the method of effecting
 polymeric encapsulation of the individual ^{crystalline} ~~crystalline~~ liquid
 droplets as disclosed and taught by British Patent 1,138,590,
 nor is any claim made here to the use of such cholesteric
 mesomorphic (liquid crystal) materials in an emulsion of un-
 encapsulated cholesteric mesomorphic material disbursed in a
 matrix like polymeric binder material as taught in British
 Patent 1,161,039. Rather, it is the purpose of this invention
 to describe and claim the utilization in novel combinations to
 produce novel products of individually encapsulated droplets
 of temperature-sensitive liquid ^{crystalline} ~~crystalline~~ material by further
 encapsulating such encapsulated droplets within a transparent
 body to form a novel product not heretofore available. It
 is within the contemplation of this invention that such further
 encapsulation of encapsulated ^{crystalline} ~~crystalline~~ liquid droplets may
 take the form of a laminate in which the encapsulated ^{crystalline} ~~crystalline~~
 liquid droplets are deposited within any preformed hollow
 transparent body, or it may be carried out by the direct admix-
 ture of encapsulated droplets of ^{crystalline} ~~crystalline~~ liquid material with
 a liquid polyester, acrylic or other transparent resin in
 liquid form so that the encapsulated beads of ^{crystalline} ~~crystalline~~ liquid
 material are suspended within the liquid phase of the poly-
 ester, acrylic or other resin and dispersed throughout such
 transparent material.

Referring to FIG. 1, in the composite view there
 shown, to the left thereof, there is illustrated the embodiment

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of the subject invention as the setting 2 for a ring, or the visible portion 3 of a bracelet. In another form, the invention may be embodied as the setting 4 of a pendant to be worn around the neck, or as the setting 6 for earrings. For men, it is feasible that the invention may be embodied in such useful items as a tie pin 7 or a tie clasp 8.

Embodiment of the invention in different forms is exemplified in FIGS. 2 through 9. Referring specifically to FIG. 2, there is there shown a body 9 of transparent material, conveniently polyester, acrylic or other resin, or a cast transparent material such as glass. The body 9 is formed with a recess defined by the inner surface 12 depressed below the level 13 of a peripheral flange 14. Within the recess thus defined, there is deposited one or more layers 16 of closely spaced encapsulated droplets of ~~crystalline~~ ^{Crystalline} liquid material conveniently caused to adhere to a substrate 17 by any suitable means such as described in British Patent 1,138,590. The substrate, for instance, may be a metal foil, or a non-metal material on one surface of which the encapsulated droplets of ~~crystalline~~ ^{Crystalline} liquid material are caused to adhere to form a cohesive film.

The film thus formed, may be a single layer of encapsulated ~~crystalline~~ ^{Crystalline} liquid droplets, or may be a plurality or multiplicity of layers, with the encapsulated droplets of each of the layers being responsive to different temperatures to produce different ~~effects~~ ^{color} effects. In FIG. 2, there is illustrated a film 16 supported on a substrate 17, with the film being two layers thick. As there shown, the substrate-supported film of encapsulated ~~crystalline~~ ^{Crystalline} liquid droplets are sealed within the recess formed within the transparent body 9 by a sealing member 18, preferably adherent to the opposite side of the substrate 17 from the encapsulated ~~crystalline~~ ^{Crystalline} liquid droplets.

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liquid droplets, and adherent also to the peripheral edge 13 of the flange 14. In this way, the encapsulated ~~crystalline~~ ^{crystalline} droplets are completely sealed from the ambient atmosphere, and yet are in direct thermoconductive relationship to the substrate 17 and the sealing member 18, so that any variation in temperature may be conducted through the sealing member 18 and substrate 17 to produce iridescence of the encapsulated ~~crystalline~~ ^{crystalline} liquid material. It will, of course, be apparent that the sealing member 18 may be a metallic or non-metallic member, the requirement being that it form a substantially hermetic seal with the peripheral edge 13 of the flange 14.

Referring to FIG. 3, there is there shown a structure similar to the structure illustrated in FIG. 2, but in which the substrate 17 has been omitted. In this instance, the recess formed within the body 9 is essentially filled with individually encapsulated droplets of the ~~crystalline~~ ^{crystalline} liquid material which may be in layer form as illustrated in FIG. 3, or which may be ~~indiscriminately~~ ^{indiscriminately} oriented one to the other, (i.e., unoriented) within the recess and then sealed therein by the sealing member 18, which again effects a substantially hermetic seal around the peripheral edge 13 of the flange 14 of the transparent body. The advantage of this construction is that the encapsulated droplets of ~~crystalline~~ ^{crystalline} liquid material may be purchased in bulk form and simply deposited within the recess within the transparent body 9. It will, of course, be obvious that the recess may be of any configuration so that a variation of effects may be visible through the transparent body within which the iridescent droplets of encapsulated ~~crystalline~~ ^{crystalline} liquid material are sealed.

While FIGS. 2 and 3 are cross-sectional views showing the relationship between the thickness of the transparent body 9 and the disposition of the encapsulated droplets

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Crystalline
of ~~crystalline~~ liquid material therewithin, it is apparent that the configuration of the body itself in a direction perpendicular to FIGS. 2 and 3 may be in any configuration. For instance, it is contemplated that such transparent body may be ovate, circular, or rectangular, or any other appropriate configuration consistent with the use to which the device when completed will be applied.

It is important also to note that with respect to the conduction of heat to the encapsulated droplets of *Crystalline* ~~crystalline~~ liquid material, such thermoconduction progresses more readily through the sealing member 18 and substrate 17, as illustrated in FIG. 2, or directly through the sealing member 18 into the encapsulated droplets directly as indicated in FIG. 3. Transmission of heat energy through the transparent body 9 is in general slower than transmission of heat energy through the opposite side of the device. In general, it may be said that the transparent body 9 functions to conduct light energy as opposed to heat energy. Thus, while heat energy is utilized to effect iridescence of the encapsulated *crystalline* ~~crystalline~~ liquid material, the transmission of light through the body 9 is effective to permit such iridescence to be visible to the naked eye and thus make this quality of iridescence of practical use with respect to novelty devices of this type.

Referring to FIG. 4, the embodiment there shown utilizes a flat transparent face plate or panel 21 against one surface 22 of which a single or multiplicity of layers of encapsulated droplets 23 of a *crystalline* ~~crystalline~~ liquid material are arranged, either indiscriminately oriented, or in layer form as indicated. In this instance, the flat transparent face panel 21 is provided with a peripheral sealing band 24 hermetically sealed by any appropriate means to the edge 26 of the

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panel 21, and cooperating with a sealing member 27 disposed substantially parallel to the transparent panel and effective to confine the encapsulated droplets of ~~crystalline~~ *crystalline* liquid material in tight contiguous relationship to the surface 22 of the transparent panel.

As with the embodiments illustrated in FIGS. 2 and 3, the sealing member 27 may be metallic or non-metallic, the criterion being that it seal the encapsulated droplets of ~~crystalline~~ *crystalline* liquid material from the ambient atmosphere.

In most instances, it is preferable that the sealing member 27 be metallic because of its advantageous thermoconduction characteristics, and also because a metallic sealing member is opaque. Thus, light transmitted through the transparent panel and striking the iridescent droplets of ~~crystalline~~ *crystalline* material will be reflected back through the transparent panel for observation.

In this regard, the peripheral seal flange 24 may be transparent or non-transparent, may be metal or non-metal, but should be compatible in its thermal expansion and contraction characteristics with the panel 21 and seal member 27, to both of which it is secured. In a preferred method of fabrication, if the transparent panel is one of the transparent synthetic resins, such as polyester or acrylic resins, it is preferred that the seal flange 24 also be fabricated from one of these materials. Where the transparent panel is fabricated from glass, the seal flange 24 may likewise be fabricated from glass, but if fabricated from metal, the nature of the union between the edge 26 of the transparent panel and the ~~metallic~~ *metallic* seal flange 24, including the cross-sectional thickness of the seal flange 24, should be gauged so that there is little or no stress in the union between these two members due to thermal expansion and contraction thereof.

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The embodiment of the invention illustrated in FIG. 5 is an expansion of the concept illustrated in FIG. 4. In this embodiment, a second panel 28 has been added to the ordinarily exposed side of the seal member 27', and an additional layer or layers or quantity of indiscriminately oriented individually encapsulated droplets of ^{crystalline} ~~crystalline~~ material 31 are disposed between the additional transparent panel 28 and the member 27' in the recess 29 in the recess formed therebetween. In this instance, the peripheral seal flange 24' is extended to overlap the peripheral edge 32 of transparent panel 28 so as to completely close the void or recess between the two transparent panels 21 and 28.

It will thus be seen that in this construction the member 27' does not act so much as a sealing member as it does a supporting or backing member for the encapsulated droplets disposed on each side thereof. Additionally, where the member 27' is opaque, as it would be if fabricated from metal, the member 27' performs the function of reflecting light passing through each of the transparent panels 21 and 28 so that the iridescent quality of the encapsulated droplets of crystalline liquid material may be visible through each of the transparent plates.

In this embodiment, it is preferable that the sealing flange 24' be fabricated from a highly thermally conductive metallic material as opposed to a non-metallic material having less thermal conductivity, so that thermal energy absorbed by the sealing flange 24' may be conducted directly to the peripheral edge of the intermediate member 27' and from this intermediate member to the contiguous encapsulated droplets of ^{crystalline} ~~crystalline~~ liquid material. It will thus be seen that iridescence through variations in color will commence initially in the peripheral margins of the device and gradually

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diffuse in vari-colored fashion through the entire expanse of the panel.

FIG. 6 illustrates an embodiment which constitutes a lamination of two of the units illustrated in FIG. 4. In the interest of brevity, corresponding reference numbers have been applied to corresponding elements of the combination. It should be noted however, that in this instance, as illustrated in FIG. 6, the sealing flange 24 is preferably fabricated from a metallic material which forms a close bond with the peripheral edge of the intermediate sealing member 27 so that there may be an efficient conduction of thermal energy from the peripheral flange 24 to the associated member 27. In this embodiment, the member 27 in each instance performs a sealing function, with the adjacent members 27 merely being secured one to the other through an appropriate adhesive.

In the embodiment of the invention illustrated in FIG. 7 and 8, the transparent body 36 constitutes a tubular member, preferably cylindrical in form, and one or more layers 37 of separately encapsulated droplets of ^{crystalline} ~~crystalline~~ liquid material are disposed contiguous to the inner peripheral surface 38 of the transparent tubular body. As previously discussed, the encapsulated droplets may be in film form, supported by an appropriate backing member 39, which may be a flexible non-metallic synthetic resinous material such as a polyester or acrylic resin, or a metallic foil on which the encapsulated droplets of ^{crystalline} ~~crystalline~~ liquid material are deposited to form a film.

This film may be caused to adhere to the inner periphery of the tubular transparent body 36 so that in effect the layer or layers of encapsulated droplets, together with the foil 39 on which they are supported, constitute a lamination bonded to the inner periphery of the tubular

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transparent body. In another aspect of this invention, the member 39 may be additionally supported by inserting a support member 41 therewithin. The support member 41 may be transparent or non-transparent, may be metallic or non-metallic and where transparent, it is preferable that the member 39 be opaque so as to increase the efficiency with which the light passing through the body 36 and striking the iridescent encapsulated droplets of ~~crystalline~~ ^{crystalline} liquid material, is reflected back through the transparent tubular body for observation.

As in the previous embodiments, the encapsulated droplets of ~~crystalline~~ ^{crystalline} liquid material are preferably isolated from the ambient by an appropriate seal member 42 secured across the end edge 43 of the tubular transparent body.

Additional support is given the sealing member 42 by a reinforcing member 44. Preferably, the sealing member 42 is also sealingly engaged to the end edge 46 of the inner tubular support member 41 where such support member is used. In terms of utility, such a tubular construction may be useful in a water system, for instance, where it is desirable to monitor the temperature of the water.

Thus, where the inner tubular support member 41 constitutes a hot water conduit, heat from this member will be conducted directly to the foil 39 and thence to the iridescent encapsulated droplets of ~~crystalline~~ ^{crystalline} liquid material. The degree of thermal energy thus conducted will be apparent to an observer, the color seen by the observer being an indication of the temperature of the liquid passing through the inner conduit 41. In this respect, it will of course be understood, different compositions of ~~crystalline~~ ^{crystalline} liquid material will produce different colors at various temperatures so that any desirable or convenient combination of colors may

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be utilized to signify different conditions or temperatures of the water passing through the inner conduit 41.

In another aspect of this invention, and relating primarily to novelty devices as opposed to industrial utilization of the invention, FIG. 9 illustrates a bracelet construction designated generally by the numeral 3, to be worn in the manner indicated in FIG. 1. In this construction, the transparent body 51 is generally toroidal in configuration, the outer peripheral surface 52 being generally circular or ovate in cross section so as to produce a lens effect to magnify the iridescent quality of the separately encapsulated droplets of a ~~crystalline~~ *crystalline* liquid material 53 confined within a recess 54 formed in the inner periphery of the toroidal body.

As indicated heretofore, the encapsulated droplets of ~~crystalline~~ *crystalline* liquid material may be appropriately mounted on a suitable film or foil 56, which may be cut in strip form so as to be accommodated within the recess 54 as shown. For additional support, and to provide direct conduction of thermal energy from the wrist of the person wearing the bracelet, and additionally to render the inner periphery of the bracelet smooth and contribute to the esthetic appeal of the bracelet, a support band 57 is preferably disposed concentrically within the inner periphery of the support film or foil 56 and caused to adhere at its lateral edges to the associated sides of the recess adjacent the inner periphery of the bracelet. In this way, the encapsulated droplets of ~~crystalline~~ *crystalline* material lie confined and hermetically isolated from the ambient atmosphere within the transparent body of the bracelet, where they may be easily subjected to variations in thermal energy so as to produce variations in color responsive to such variations in temperature.

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From the foregoing, it will be apparent that the invention may be embodied in many different forms to provide devices of both novelty and industrial application. It should especially be noted that shapes do not limit the uses to which the encapsulated droplets of ^{crystalline} ~~crystalline~~ liquid material may be put, the concept of further encapsulation of the encapsulated droplets of ^{crystalline} ~~crystalline~~ material being applicable in many different embodiments within the scope of the appended claims.

Having thus described my invention, what is claimed to be novel and sought to be protected by letters patent is as follows:

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1 CLAIM:

1. An article of manufacture, the combination comprising:

- a) a transparent body; and
- b) a multiplicity of separately encapsulated droplets of a crystalline liquid encapsulated in turn within said transparent body, said droplets of separately encapsulated crystalline liquid iridescent when subjected to varying temperatures to display through said transparent body varying colors correlated to said varying temperatures.

2. The combination according to Claim 1, in which said transparent body is formed from synthetic resinous material.

3. The combination according to Claim 1, in which said transparent body is formed from a synthetic resinous material selected from the group consisting of polyester and acrylic resins.

4. The combination according to Claim 1, in which said encapsulated droplets of crystalline liquid are uniformly dispersed throughout said transparent body.

5. The combination according to Claim 1, in which said encapsulated droplets of crystalline liquid are uniformly dispersed throughout a selected portion of said transparent body.

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10-11-01
23/631

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6. The combination according to Claim 1, in which said transparent body is generally flat having a peripheral flange defining a recess within said body, said multiplicity of separately encapsulated droplets of crystalline liquid are deposited within said recess, and means are provided sealing said recess whereby said encapsulated droplets of crystalline liquid are sealed within the recess of said transparent body.

7. The combination according to Claim 1, in which said transparent body is generally flat having a recess there-within, said encapsulated droplets of crystalline liquid are disposed in self-supporting film form and deposited in said recess, and means superimposed over the film of encapsulated droplets of crystalline liquid to support said film and seal said recess.

8. The combination according to Claim 1, in which said transparent body is tubular in form having inner and outer peripheral surfaces, said encapsulated droplets of crystalline liquid are disposed in a layer adjacent the inner peripheral surface of said tubular transparent body, and means are provided superimposed over the layer of encapsulated droplets of crystalline liquid to seal the encapsulated droplets against the inner peripheral surface of the tubular transparent body.

9. The combination according to Claim 1, in which said transparent body comprises a flat sheet, said encapsulated droplets of crystalline liquid are disposed in a layer on one surface of said flat transparent sheet, a flat opaque backing member is superimposed coextensively over said layer

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of encapsulated droplets, and means sealing marginal edge portions of said ~~flat~~ opaque backing member to said flat transparent sheet ~~to enclose and support said beads between said flat transparent sheet and the flat backing member.~~

B 12. The combination according to Claim ~~10~~¹⁵⁴ in which said means sealing said recess comprises a hardened mass cast in said recess and adherent to said transparent body and to said multiplicity of encapsulated droplets of crystalline liquid.

B 13. The combination according to Claim ~~11~~¹⁵⁴ in which said means superimposed over said layer of encapsulated droplets of crystalline material comprises a tubular member.

add B²

12. The combination according to Claim 9, in which a second layer of encapsulated droplets of crystalline liquid is disposed on the other side of said flat opaque backing member from said first layer of encapsulated droplets of crystalline liquid, and a second transparent flat sheet is disposed over said second layer of encapsulated droplets of crystalline liquid material, said marginal sealing means sealing marginal edges of both said transparent sheets and the intervening flat opaque backing member.

13. The combination according to Claim 9, in which a second assembly including a transparent flat sheet, a layer of encapsulated droplets of crystalline liquid, and a flat opaque backing member is mounted on said first assembly, said flat opaque backing members lying in close juxtaposed relation, and adhesive means securing said backing members to each other.

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SOLE

PCH-50
(5/8/48)

Oath, Power of Attorney, and Petition

Being duly sworn, I, ²⁰¹ BILL G. JAMES

residing at 1895 Cordilleras Road, Redwood City, California; that I have read the foregoing specification and claims and I verily believe I am the original, first, and sole inventor of the invention or discovery in HEAT SENSITIVE NOVELTY DEVICE

described and claimed therein; that I do not know and do not believe that this invention was ever known or used before my invention or discovery thereof, or patented or described in any printed publication in any country before my invention or discovery thereof, or more than one year prior to this application, or for public use or on sale in the United States for more than one year prior to this application; that this invention or discovery has not been patented in any country foreign to the United States on an application filed by me or my legal representatives or assigns more than twelve months before this application; and that no application for patent on this invention or discovery has been filed by me or my representatives or assigns in any country foreign to the United States, ~~except as follows~~, and that my full first name is as herein typed and written.

And I hereby appoint ⁴⁰¹⁻³¹ John J. LeavittSuite 610, 777 North First Street, San Jose, California 95112

Registration No. 18,440, my attorney or agent with full power of substitution and revocation, to prosecute this application and to transact all business in the Patent Office connected therewith.

Wherefore I pray that Letters Patent be granted to me for the invention or discovery described and claimed in the foregoing specification and claims, and I hereby subscribe my name to the foregoing specification and claims, oath, power of attorney, and this petition, this

11 day of October, 1971

Inventor

FIRST NAME
BillMIDDLE INITIAL
G.LAST NAME
James

Post Office Address

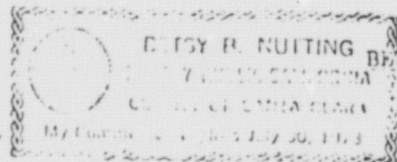
1895 Cordilleras Road
Redwood City, CaliforniaState of CALIFORNIACounty of Santa Clara

SS.

Before me personally appeared BILL G. JAMES

to me known to be the person described in the above application for patent, who signed the foregoing instrument in my presence, and made oath before me to the allegations set forth therein as being under oath, on the day and year aforesaid.

SEAL



BETSY B. NUTTING

NAME (TYPED OR PRINTED)
Notary Public in and for said State.Betsy B. Nutting

This form may be executed only when attached to a complete application as the last page thereof.

Approved Single Signature Form
Sole Inventor
(No. 438)

PLAINTIFFS' EXHIBIT 2



U.S. DEPARTMENT OF COMMERCE
Patent Office

Address Only: COMMISSIONER OF PATENTS
Washington, D.C. 20231

R. Anshel Art Unit 164

Paper No. 2

187-168
187-168

Dated: 2-10-71

PLAINTIFFS
187-168
187-168

This is a communication from the Examiner in
charge of your application.

Commissioner of Patents

The application has been examined.

Responsive to communication filed

☐ This action is made final.

A SHORTENED STATUTORY PERIOD FOR RESPONSE TO THIS ACTION IS SET TO EXPIRE

THREE MONTH(S) NO DAYS FROM THE DATE OF THIS LETTER.

PART I

The following attachment(s) are part of this action:

- a. ☒ Notice of References Cited, Form PO-892. b. ☐ Notice of Informal Patent Drawing, PO-948.
c. ☐ Notice of Informal Patent Application, Form PO-152. d. ☐

PART II

Summary of Action

1 to 13 Claims are presented for examination.

NONE Claims are allowed.

1 to 13 Claims would be allowable if amended as indicated.

1 to 13 Claims are rejected.

1 to 13 Claims are objected to.

1 to 13 Claims are subject to restriction or election requirements.

1 to 13 Claims are withdrawn from consideration.

8. ☐ Since this application appears to be in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under Ex parte Quayle, 1935 C.D. 11; 453 O.G. 213.

9. ☐ Since it appears that a discussion with applicant's representative may result in agreements whereby the application may be placed in condition for allowance, the examiner will telephone the representative within about 2 weeks from the date of this letter.

10. ☐ Receipt is acknowledged of papers under 35 USC 119, which papers have been placed of record in the file.

11. ☐ Applicant's claim for priority based on an application filed in _____ on _____ is acknowledged. It is noted, however, that a certified copy as required by 35 USC 119 has not been received.

12. ☐ Other

PLAINTIFFS' EXHIBIT 2

U.S. DEPARTMENT OF COMMERCE

Patent Office

PART III

SERIAL
NUMBER

189188

GROUP ART UNIT 154

NOTIFICATION OF REJECTION(S) AND/OR OBJECTION(S) (35 USC 132)

	CLAIMS (1)	REASONS FOR REJECTION (2)	REFERENCES * (3)	INFORMATION IDENTIFICATION AND COMMENTS (4)
1	1-6, 7+10	3545C 102	H	SEE COL. 2, LINES 13-15, COL. 3, LINES 15-20, AND COL. 4, LINES 17-21 OF A.
2	7, 8 + 11-13	3545C 103	A	CLAIMS 12 + 13 DEFINE ASSEMB- LIES WHICH ARE CONSIDERED TO INVOLVE HERE DUPLICATION OVER THOSE TAUGHT BY A. FURTHER DEEMED OBVIOUS TO PROVIDE LAMINATES (CONT. PG 6)
3		1	B, C & D	REFERENCES B-D ARE CITED AS OF INTEREST MERELY TO SHOW STATE OF PRIOR ART.
4				
5				
6	(Pg 2 CONT.) OF A IN ANY DESIRED SHAPE OR FORM SUCH AS RECITED IN CLAIMS 8 + 11. THE ASSEMBLY SET FORTH IN CLAIM 7 IS CONSIDERED NOT TO DIFFER IN STRUCTURE OF FINAL ARTICLE, OVER THOSE DISCLOSED BY A.			
7	THE SPELLING OF --CRYSTALLINE-- SHOULD BE CORRECTED IN ALL OCCURRENCES IN SPEC. ON PG 1 L. 2 CHANGE "PRESENTED IS A" TO --A-- ON PG 2 L. 8 INSERT --EITHER-- BEFORE "TO". ON PG 2 L. 9 CANCEL "EITHER" ON PG 2 L. 10 INSERT --TO-- BEFORE "ENCAPSULATE" ON PG 3 L. 31 CANCEL "LIGHTS OR". ON PG 7 L. 26 INSERT --COLOR-- BEFORE "EFFECTS". ON PG 8 L. 18 CORRECT SPELLING OF --INDISCRIMI- NATELY-- ON PG 10, L. 29 CORRECT SPELLING OF --METALLIC-- CORRECTION IS REQUIRED. ON PG 6 L. 1 OF SPEC-- THE WORD "DERIVATIVES" IS QUERIED. "IS-- DERIVATIVES-- INTERRUPTED? THE LINE 7-7 MENTIONED ON PG 5 LINE 12 OF SPEC IS NOT FOUND IN FIG 8 OF DRAWING. CORRECTION IS REQUIRED.			

* Capital letters representing references are identified on accompanying Form PO-892.
The symbol "v" between letters represents --in view of--
The symbol "i" or "b" between letters represents --and--
A slash "/" between letters represents the alternative --or--

NOTE: Sections 100, 101, 102, 103 and 112 of the Patent Statute (Title 35 of the United States Code) are reproduced on the back of this sheet.

EXAMINER
ANSHER H.
A. Ansher
HAROLD ANSHER
EXAMINER
GROUP ART UNIT 154

TEL. NO. 3731
(703) 557-

PLAINTIFFS' EXHIBIT 2

U. S. DEPARTMENT OF COMMERCE PATENT OFFICE		SERIAL NO. 189188	GROUP AND UNIT 164	ATTACHMENT TO PAPER NUMBER 2			
NOTICE OF REFERENCES CITED		APPLICANT(S) JAMES, B. G.					
Check here if this is a supplemental citation. (Do not prepare an additional folder.)		U. S. PATENTS					
	PATENT NO.	DATE	PATENTEE	CLASS	SUB-CLASS	FILING DATE IF APPROPRIATE	
A	285381	6-17-71	HODSON, Adm. 164	449X			
B	3574043	4-17-71	LUBER, Adm. 216	5			
C	3637221	1-19-72	KESSLER, Adm. 280	2-11-70			
D	3647280	3-1-72	KLEIN, Adm. 350	160R	11-6-69		
E							
F							
G							
H							
I							
J							
K							
FOREIGN PATENTS OR PUBLISHED APPLICATIONS							
	PATENT NO.	DATE	COUNTRY	NAME	CLASS	SUB-CLASS	PERTINENT SHTS. PR. FIG. SPEC.
L							
M							
N							
O							
P							
Q							
OTHER REFERENCES (Including Author, Title, Date, Pertinent Pages, Etc.)							
R							
S							
T							
U							
EXAMINER ANSHER, H.		DATE 1-26-73		<input type="checkbox"/> CHECK HERE IF FOREIGN EXCHANGE			
* ATTENTION R. O. B.: Do not furnish copy if this box is checked.							

PLAINTIFFS' EXHIBIT 2



IN THE UNITED STATES PATENT OFFICE

RECEIVED

MAY 21 1973

GROUP 160

3/12-
fuchB. M. M.
5-9-73

In re application of

BILL G. JAMES

Serial No.: 189,188 ✓

Filed: October 14, 1971

For: HEAT SENSITIVE NOVELTY
DEVICE

Examiner: H. Ansher

Group Art Unit: 164

San Jose, California
May 11, 1973Honorable Commissioner of Patents
Washington, D. C. 20231

Sir:

This is in response to Office Action mailed
February 12, 1973.

Please amend the application as follows:

IN THE SPECIFICATION

Page 1, line 1, delete "Presented is a" and sub-
stitute --A--;

Lines 2, 9, 12, 13, 18, 19 and 25, in each
line, change the spelling of the word "crystalline" to
--crystalline--.

Page 2, line 8, before "to" insert --either--;

line 9, delete "either";

line 10, before "encapsulate" insert

--to--;

PLAINTIFFS' EXHIBIT 2

Page 11, lines 6 and 30, change "crystalline"
to --crystalline--.

Page 12, lines 19 and 26, change "crystalline"
to --crystalline--.

Page 13, lines 8, 12, 25 and 30, change "crystalline"
to --crystalline--.

Page 14, lines 12, 16 and 28, change "crystalline"
to --crystalline--.

Page 15, lines 5 and 7, change "crystalline" to
--crystalline--.

REMARKS

Claims 1 through 13 remain in the application.

Applicant has carefully reviewed the prior art cited by the Examiner in connection with these claims and respectfully traverses the Examiner's contention that Claims 1, 6, 9 and 10 lack novelty under 35 USC 102 in view of Hodson Patent 3,585,581; and that claims 7, 8 and 11-13 are unpatentable under 35 USC 103 in view of the Hodson patent.

Referring to Figs. 1, 2 and 3 of Hodson, it is clearly seen from the cross-sectional views depicted thereat, taken with the portions of the specification noted by the Examiner, that

PLAINTIFFS' EXHIBIT 2

had in mind nothing more than a laminate in which the encapsulated liquid crystals are laminated on the underside of a flat transparent member. There is no suggestion in this patent of the desirability or necessity of (sealing the encapsulated liquid crystals within a transparent body) as opposed to merely laminating them on one side thereof. Thus, with respect to Claim 1, applicant is unable to find disclosed or suggested in Hodson structure which satisfies the terminology "encapsulated droplets of a crystalline liquid encapsulated in turn within said transparent body". Underlining added.

Referring to Claim 4, no where in Hodson is there a teaching equivalent to this claim which calls for the encapsulated droplets of crystalline liquid to be uniformly dispersed throughout the transparent body. Again, the most that Hodson teaches is the utilization of encapsulated droplets of crystalline liquid formed into a slurry or emulsion which is then painted on the underside of a supporting member and allowed to dry.

Comparing applicant's Claims 1 and 4, it is noted that Claim 1 specifies that the encapsulated droplets of crystalline liquid are related to the transparent body by being "within said transparent body" as opposed to merely being laminated thereon. There is no limitation in this claim with respect to the type of dispersion of the droplets within the transparent body. Claim 4, on the other hand, specifies that the encapsulated droplets of crystalline liquid are uniformly dispersed throughout the transparent body. It is clear from a detailed analysis of the Hodson patent that the teaching of that patent does not anticipate the claims as presented.

PLAINTIFFS' EXHIBIT 2

Claim 6 was also rejected on Hodson under 35 USC 102, and applicant is at a loss to understand the basis for this rejection. This claim clearly specifies that applicant's transparent body is provided with a peripheral flange defining a recess within the body. Nowhere does Hodson disclose or suggest such a peripheral flange or recess within his member 4. Additionally, this claim explicitly specifies that a multiplicity of separately encapsulated droplets of crystalline liquid are deposited within the recess. Again, there is nothing in Hodson to suggest this relationship between the encapsulated droplets and the recessed body as claimed by applicant. If the foregoing distinctions were insufficient to support patentability, which applicant respectfully submits is not the case, then the additional phraseology of Claim 6 certainly raises applicant's structure to the level of patentable invention in view of Hodson. Specifically, nowhere in Hodson is there taught a structure which meets the terminology "means are provided sealing said recess--."

It is noted that the product described and claimed in the Hodson patent is sold by the National Cash Register Company and is the same product that applicant purchases from the National Cash Register Company for utilization by him in his product. Thus, applicant is not claiming the National Cash Register Company product, but is merely using it as one element in what applicant submits constitutes an inventive and patentable combination.

Claim 8 is dependent on Claim 1 and therefore incorporates all of the distinguishing characteristics of that claim. Additionally, Claim 9 specifically calls for

"means sealing marginal edge portions of said flat opaque backing member to said flat transparent sheet",

PLAINTIFFS' EXHIBIT 2

and applicant has been unable to find any disclosure or suggestion in Hodson that meets this terminology. Further, it is noted that in Hodson, the encapsulated droplets of crystalline liquid are embedded in a polymeric binder whereas Claim 9 is not limited to the use of such a binder, it being applicant's intent that the encapsulated droplets of crystalline liquid may be used in bulk and sealed within an appropriate chamber or recess formed within the transparent body.

Claim 10 was also rejected under 35 USC 102 in view of Hodson, and again applicant is unable to find a disclosure or even a suggestion in Hodson of a recess in the transparent body, of means sealing such a recess, and specifically of a means sealing such a recess in which the means constitutes a hardened mass adherent to both the transparent body and to the encapsulated droplets of crystalline liquid.

In view of the above, it is clear that applicant's contribution to the art is not only novel, thus making a rejection of his claims under 35 USC 102 inappropriate, but is obviously distinctively different in structure and function so as to be patentable over the Hodson patent even under 35 USC 103. The Examiner's reconsideration of these claims in the light of applicant's comments would be greatly appreciated.

Claims 7, 8 and 11 through 13 were rejected under 35 USC 103 in view of Hodson. Applicant respectfully traverses this rejection, reasserting herein the comments made above with respect to the rejection under 35 USC 102, and noting further, especially with respect to Claim 7, that Claim 7 specifies a recess within the transparent body (Hodson has no recess), the

PLAINTIFFS' EXHIBIT 2

crystalline liquid droplets being disposed in a self-supporting form "deposited in said recess" with the addition of sealing means superimposed over the film of encapsulated droplets of crystalline liquid to support the film and seal the recess. There is nothing in Hodson that suggests this novel combination.

With respect to Claim 8, the limitations specifically included in this claim relate the transparent body to a tubular form not found in any of the references of record, especially the Hodson patent. Nowhere in Hodson is there a suggestion of a tubular transparent body. Nowhere in Hodson is there a disclosure or suggestion that encapsulated droplets of crystalline liquid may be disposed in a layer adjacent to the inner peripheral surface of a tubular transparent body, and nowhere in Hodson is there a suggestion or disclosure of means for sealing the encapsulated droplets against the inner peripheral surface of the tubular transparent body. The only source for any such teaching is applicant's own application, and applicant respectfully submits that his application may not properly be used as a "teaching tool" to teach the reorganization and reconstruction of a reference which itself does not teach what applicant teaches.

Claim 11 is dependent on Claim 8 and therefore includes all of the explicit and implicit distinguishing characteristics of that claim. Additionally, Claim 8 further defines the means for sealing the encapsulated droplets of crystalline liquid material against the inner peripheral surface of the tubular transparent body as being itself a tubular member. Again, there is nothing in Hodson that suggests this combination, nor is there any suggestion in Hodson of the ultimate use or function to which a transparent tubular body as claimed by applicant

PLAINTIFFS' EXHIBIT 2

may be put.

Claim 12 is directed to the embodiment of applicant's invention illustrated in Figs. 5 and 6, and applicant has been unable to find in Hodson even a suggestion of a teaching of the novel combination illustrated and described herein. The "sandwich" formed by applicant's Fig. 5 structure contemplates separate layers of encapsulated droplets of crystalline liquid disposed on opposite sides of a single opaque member 27' with the spaces between the opaque member and the associated surfaces of the transparent panes being filled with encapsulated droplets of crystalline liquid, and the peripheral edges of the "sandwich" being provided with marginal sealing means sealing the marginal edges of both the transparent panes and the intervening flat opaque backing member. There is nothing in Hodson to suggest this cooperative combination.

The distinction is carried even further by the specifically recited structure of Claim 13, in which the structure of Claim 8, which itself is novel and patentably different from Hodson, is combined with a second assembly in such manner that a pair of flat opaque backing members may lie in close juxtaposed relationship so that adherent means disposed between the two juxtaposed flat backing members may retain the two opaque members together. Again, Hodson is completely devoid of any teaching of this combination. It is not enough to negate patentable invention to say that an invention is obvious from the prior art when the only suggestion of that invention can be secured only from applicant's own disclosure.

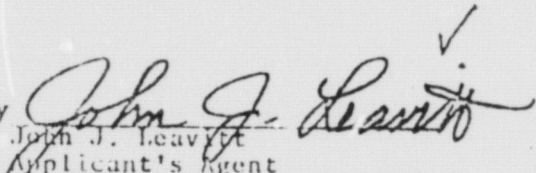
PLAINTIFFS' EXHIBIT 2

Applicant has made an earnest and sincere effort to meet every objection posed by the Examiner to clearly differentiate his invention from the teaching of Hodson. It is believed that in the absence of other and more pertinent prior art the claims as re-presented for reconsideration may properly be allowed.

Respectfully submitted,

BILL G. JAMES

By


John J. Leavitt
Applicant's Agent
777 North First Street
Suite 610
San Jose, California 95112
(408) 286-2262

PLAINTIFFS' EXHIBIT 2



RECEIVED

MAY 21 1973

GROUP 100

IN THE UNITED STATES PATENT OFFICE

In re application of
 BILL G. JAMES
 Serial No.: 189,188
 Filed: October 14, 1971
 For: HEAT SENSITIVE NOVELTY
 DEVICE

Examiner: H. Ansher
 Group Art Unit: 164

San Jose, California
 May 11, 1973

O.K. to correct
A. Ansher

Honorable Commissioner of Patents
 Washington, D. C. 20231

Sir:

This is supplemental to applicant's response of
 even date to Office Action mailed February 12, 1973.

The Examiner approving, the office draftsman
 is authorized and requested to insert the line 7-7 in
 Fig. 8 of the drawing as illustrated in the accompanying
 print.

The cost of the above may be charged to Deposit
 Account No. 12-0765.

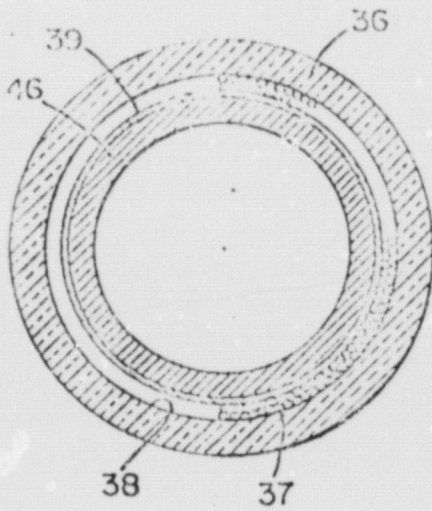
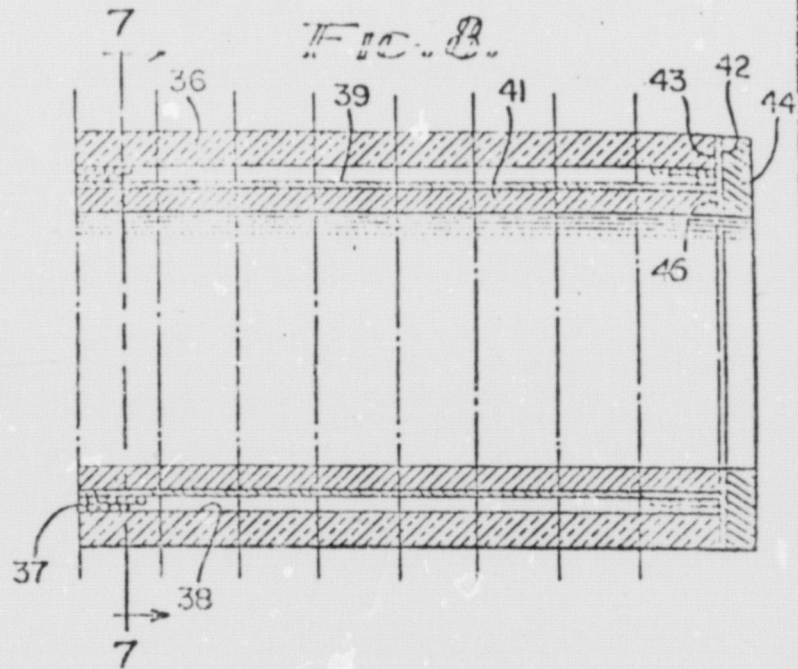
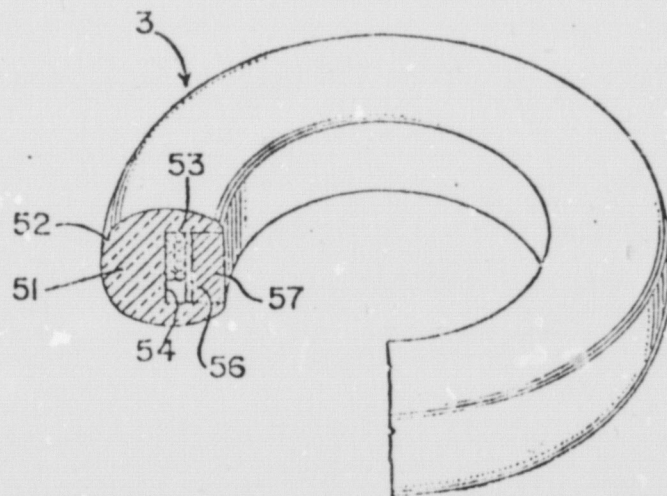
Respectfully submitted,

BILL G. JAMES

100
 CORRECTED
 SEP 21 1973
 PRO COPIES
 MAILED

By *John J. Leavitt*
 John J. Leavitt
 Applicant's Agent
 777 North First Street
 Suite 610
 San Jose, California 95112
 (408) 286-2262

PLAINTIFFS' EXHIBIT 2

FIG. 7.*FIG. 8.**FIG. 9.*

INVENTOR
BILL G. JAMES

BY *John J. Leavitt*

PLAINTIFFS' EXHIBIT 2



IN THE UNITED STATES PATENT OFFICE

JUN 1 1973
 GROUP 160 #15
 Exhibit
 J. Harris
 6/13/73

In re application of

BILL G. JAMES

Serial No.: 189,188

Filed: October 14, 1971

For: HEAT SENSITIVE NOVELTY
DEVICE

Examiner: H. Ansher

Group Art Unit: 164

San Jose, California
May 25, 1973Honorable Commissioner of Patents
Washington, D. C. 20231

Sir:

This is supplemental to the amendment dated May
11, 1973 responding to Office Action mailed February 12, 1973.

In the interest of clarifying issues and providing
as much information for the Examiner as possible, applicant
has attached hereto as Exhibit A, a sample of the material
which he purchases from National Cash Register and which is
believed to form the subject matter of the primary reference
cited in the case, namely, Hodson Patent 3,585,381.

Also attached as Exhibit B is a sample of applic-
ant's product, fabricated using the material of Exhibit A.

Respectfully submitted,

BILL G. JAMES

By

John J. Leavitt
 John J. Leavitt
 Applicant's Agent
 777 North First Street
 Suite 610
 San Jose, California 95112
 (408) 286-2262

PLAINTIFFS' EXHIBIT 2

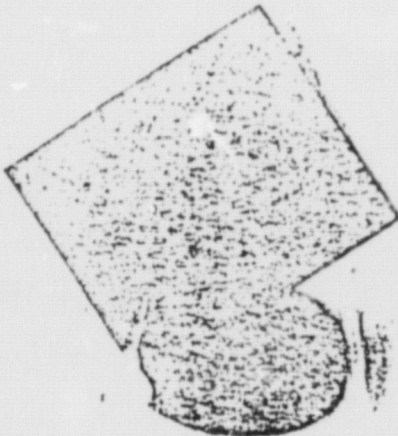


EXHIBIT A

EXHIBIT B

PLAINTIFFS' EXHIBIT 2

U.S. DEPARTMENT OF COMMERCE
Patent OfficeAddress Only: COMMISSIONER OF PATENTS
Washington, D.C. 20231

H. Ansher

Art Unit 164

Paper No. 6

MAILED

10/14/71
JAMES, BILL G.,

167-188

Mailed

JUL 13 1973

JOHN J. LEAVITT,
777 NORTH FIRST ST.
SAN JOSE, CALIF. 95112

GROUP 160

This is a communication from the Examiner in
charge of your application.

Commissioner of Patents

☐ This application has been examined.☒ Responsive to communication filed May 14 & May 27, 1973. This action is made final.

A SHORTENED STATUTORY PERIOD FOR RESPONSE TO THIS ACTION IS SET TO EXPIRE

Three MONTH(S) No DAYS FROM THE DATE OF THIS LETTER.

PART I

The following attachment(s) are part of this action

- a. ☐ Notice of References Cited, Form PO-892. b. ☐ Notice of Informal Patent Drawing, PO-948.
c. ☐ Notice of Informal Patent Application, d. ☐
Form PO-152.

PART II

1. ☒ Claims 1 to 13 Summary of Action are presented for examination.
2. ☐ Claims _____ are allowed.
3. ☒ Claims 6 to 8 and 10 to 13 would be allowable if amended as indicated.
4. ☒ Claims 1 to 5 and 9 are rejected.
5. ☒ Claims 6 to 8 and 10 to 13 are objected to.
6. ☐ Claims _____ are subject to restriction or election requirement.
7. ☐ Claims _____ are withdrawn from consideration.
8. ☐ Since this application appears to be in condition for allowance except for formal matters, prosecution on the merits is closed in accordance with the practice under Ex parte Quayle, 1935 C.D. 11; 453 OG, 213.
9. ☐ Since it appears that a discussion with applicant's representative may result in agreements whereby the application may be placed in condition for allowance, the examiner will telephone the representative within about 2 weeks from the date of this letter.
10. ☐ Receipt is acknowledged of papers under 35 USC 119, which papers have been placed of record in the file.
11. ☐ Applicant's claim for priority based on an application filed in _____ on _____ is acknowledged. It is noted, however, that a certified copy as required by 35 USC 119 has not been received.
12. ☐ Other

PLAINTIFFS' EXHIBIT 2

Serial No. 189,188

-2-

Art. Unit 164

Responsive to amendment filed May 14,
1973.

Receipt is acknowledged of applicant's
letter and attached Exhibits submitted May 29,
1973.

Acknowledgment is further made of applicants'
letter to the Draftsman filed May 14, 1973.

In the specification, on page 5, line 12
--an-- should be inserted before "embodiment".
Correction is required.

Claims 1-5 and 9 are each rejected under 35
U.S.C. 103 as being unpatentable over Hodson et al
(A) of record. Hodson et al disclose a laminated product
wherein an encapsulated liquid-crystal member is
bonded to, and embedded between, an opaque backing sheet
1 and a transparent upper body member 4; see Figure 1.
Whether the encapsulated liquid crystals are bonded to
the surface of the flat transparent member 4 of
Hodson et al or whether they are embedded within said
transparent member 4, as recited in applicants' claims,
is considered to involve a mere matter of choice and
an obvious expedient to the ordinarily skilled laminating
chemist. In any event, no new or unexpected optical results are
apparent to the Examiner by embedding said liquid crystals

PLAINTIFFS' EXHIBIT 2

Serial No. 189,188

-3-

Art. Unit 164

instead of bonding them to the surface of the transparent body member 4 of Hodson et al. In column 4, lines 17-21 Hodson et al disclose that their transparent body member 4 may be composed of either polyester or acrylic resin, as recited in claim 3 herein. The polymeric adhesive binder 3 of Hodson et al would inherently serve to seal the marginal edge portions of the laminated product, shown in Figure 1 of the patent, in the manner recited in claim 9 herein. Applicants' arguments have been carefully studied but, for the reasons explained above, have not persuaded the Examiner that the above rejected claims are patentable over the Hodson et al reference.

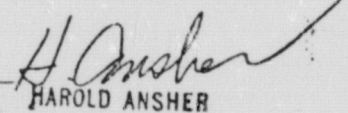
Claims 6-8 and 10-13 are considered to include allowable subject matter but are objected to as depending from rejected claims. If claims 6-8 and 10-13 were rewritten in independent form so as not to depend from rejected claims, such rewritten claims could be allowed.

Claims 1-5 and 9 are rejected.

Claims 6-8 and 10-13 are objected to.

Since a clear issue has been reached this action is made FINAL.

H. ANSHER:raj
(703) 557-3731
7-12-73


HAROLD ANSHER
EXAMINER
GROUP ART UNIT 164



PLAINTIFFS' EXHIBIT 2

IN THE UNITED STATES PATENT OFFICE

SEP 12 1973

RECEIVED
SEP 10 1973
GROUP, 160 7/1
Sub

In re application of
BILL G. JAMES
Serial No.: 189,188 ✓
Filed: October 14, 1971
For: HEAT SENSITIVE
NOVELTY DEVICE

Examiner: H. Ansher
Group Art Unit: 164

OK to enter
H. Ansher

San Jose, California
August 8, 1973

Honorable Commissioner of Patents
Washington, D. C. 20231

Sir:

This is in response to Office Action mailed
July 13, 1973.

Please amend the application as follows:

Please cancel Claims 2, 3, 4, 5, 6, 7, 8 and 9
without prejudice.

Please re-write Claim 1 amended as follows to
include the subject matter of allowed Claim 6:

1. ~~[Amended]~~ As an article of manufacture, the
combination comprising:

a) a transparent body; [and]

b) a multiplicity of separately encapsulated

09/10/73 189183

1 102 40.00CK

-16-1-

PLAINTIFFS' EXHIBIT 2

droplets of a crystalline liquid encapsulated in turn within said transparent body, said droplets of separately encapsulated crystalline liquid iridescent when subjected to varying temperatures to display through said transparent body varying colors correlated to said varying temperatures[.];

B¹ c) said transparent body being generally flat and having a peripheral flange defining a recess within said body, said multiplicity of separately encapsulated droplets of crystalline liquid being deposited within said recess; and

d) means for sealing said recess whereby said encapsulated droplets of crystalline liquid are sealed within the recess of said transparent body. *2.0. Jan. 2 Yellow*

Please add the following claims, which constitute allowed Claims 7, 8, 12 and 13 re-written in independent form as suggested by the Examiner:

PLAINTIFFS' EXHIBIT 2

(2) ~~As~~ As an article of manufacture, the combination comprising:

- B²
- a) a transparent body;
 - b) a multiplicity of separately encapsulated droplets of a crystalline liquid encapsulated in turn within said transparent body, said droplets of separately encapsulated crystalline liquid iridescent when subjected to varying temperatures to display through said transparent body varying colors correlated to said varying temperatures;
 - c) said transparent body being generally flat and having a recess therewithin, said encapsulated droplets of crystalline liquid being disposed in self-supporting film form and deposited in said recess; and
 - d) means superimposed over the film of encapsulated droplets of crystalline liquid to support said film and seal said recess.
- P.

(4) ~~As~~ As an article of manufacture, the combination comprising:

- a) a transparent body;
- b) a multiplicity of separately encapsulated

PLAINTIFFS' EXHIBIT 2

droplets of a crystalline liquid encapsulated in turn within said transparent body, said droplets of separately encapsulated crystalline liquid iridescent when subjected to varying temperatures to display through said transparent body varying colors correlated to said varying temperatures;

B²

c) said transparent body being tubular in form and having inner and outer peripheral surfaces, said encapsulated droplets of crystalline liquid being disposed in a layer adjacent the inner peripheral surface of said tubular transparent body; and

d) means superimposed over the layer of encapsulated droplets of crystalline liquid to seal the encapsulated droplets against the inner peripheral surface of the tubular transparent body.

⑥ ~~to:~~ As an article of manufacture, the combination comprising:

- a) a transparent body;
- b) a multiplicity of separately encapsulated droplets of a crystalline liquid encapsulated in turn within said transparent body,

PLAINTIFFS' EXHIBIT 2

said droplets of separately encapsulated crystalline liquid iridescent when subjected to varying temperatures to display through said transparent body varying colors correlated to said varying temperatures;

c) said transparent body comprising a flat sheet, said encapsulated droplets of crystalline liquid are disposed in a layer on one surface of said flat transparent sheet;

d) a flat opaque backing member superimposed coextensively over said layer of encapsulated droplets;

e) means sealing marginal edge portions of said flat opaque backing member to said flat transparent sheet to enclose and support said ~~beads~~ ^{encapsulated droplets} between said flat transparent sheet and the flat backing member;

f) a second layer of encapsulated droplets of crystalline liquid disposed on the other side of said flat opaque backing member from said first layer of encapsulated droplets of crystalline liquid; and

g) a second transparent flat sheet disposed over said second layer of encapsulated droplets

PLAINTIFFS' EXHIBIT 2

of crystalline liquid material, said marginal sealing means sealing marginal edges of both said transparent sheets and the intervening flat opaque backing member.

B² *7/47* As an article of manufacture, the combination comprising:

- a) a transparent body:
- b) a multiplicity of separately encapsulated droplets of a crystalline liquid encapsulated in turn within said transparent body, said droplets of separately encapsulated crystalline liquid iridescent when subjected to varying temperatures to display through said transparent body varying colors correlated to said varying temperatures;
- c) said transparent body comprising a flat sheet, said encapsulated droplets of crystalline liquid are disposed in a layer on one surface of said flat transparent sheet;
- d) a flat opaque backing member superimposed coextensively over said layer of encapsulated droplets;
- e) means sealing marginal edge portions of said flat opaque backing member to said flat

PLAINTIFFS' EXHIBIT 2

transparent sheet to enclose and support
 said ^{encapsulated droplets} ~~herds~~ between said flat transparent
 sheet and the flat backing member;

- B²
- f) a second assembly including a transparent flat sheet, a layer of encapsulated droplets of crystalline liquid, and a flat opaque backing member mounted on said first assembly, said flat opaque backing members lying in close juxtaposed relation; and
- g) adhesive means securing said backing members to each other.
-

Claim 10, line 1, change the dependency of this claim from "Claim 6" to --Claim 1--.

Claim 11, line 1, change the dependency of this claim from "Claim 8" to --Claim 15--.

PLAINTIFFS' EXHIBIT 2

REMARKS

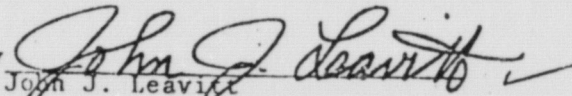
The amendments above represent original allowed Claims 6-8 and 10-13 in independent form, or change the dependency to include all the subject matter previously included in these claims.

It is believed the application may now be passed to allowance with seven allowed claims.

Respectfully submitted,

BILL G. JAMES

By


John J. Leavitt

Applicant's Agent
777 North First Street
Suite 610
San Jose, California 95112
(408) 286-2262

PLAINTIFFS' EXHIBIT 2



U.S. DEPARTMENT OF COMMERCE
Patent Office

Address Only: COMMISSIONER OF PATENTS
Washington, D.C. 20231

H. Ansher Art Unit 164
Oct. 14, 1971 189,188

Paper No. 8

Bill G. James

H. Ansher: jng
(703) 557-3735
9/14/73

HEAT SENSITIVE NOVELTY DEVICE

MAILED

John J. Leavitt
777 North First Street
San Jose, Calif. 95112

SEP 17 1973
This is a communication from the Examiner in
charge of your application.

GROUP 160
Commissioner of Patents

1. ☐ The communication filed _____ is informal/non-responsive for the reason(s) checked below and should be corrected. APPLICANT IS GIVEN ONE MONTH FROM THE DATE OF THIS LETTER OR UNTIL THE EXPIRATION OF THE PERIOD FOR RESPONSE SET IN THE LAST OFFICE ACTION (WHICHEVER IS LONGER) WITHIN WHICH TO CORRECT THE INFORMALITY.
 - a. ☐ The amendment to claim(s) _____, filed _____, fails to comply with the provisions of rule 121 and is accordingly held to be non-responsive. A supplemental paper correcting the informal portions and complying with the rule is required.
 - b. ☐ The paper is unsigned. A duplicate paper or ratification, properly signed, is required.
 - c. ☐ The paper is signed by _____, who is not of record. A ratification or a new power of attorney with a ratification, or a duplicate paper signed by a person of record, is required.
 - d. ☐ The communication is presented on paper which will not provide a permanent copy. A permanent copy, or a request that a permanent copy be made by the Office at applicant's expense, is required. See M.P.E.P. 714.07.
 - e. ☐ Other _____
2. ☐ In accordance with applicant's request, THE PERIOD FOR RESPONSE FROM THE OFFICE ACTION DATED _____ IS EXTENDED TO RUN _____ MONTH(S).
No further extension will be granted unless approved by the Commissioner. Rule 135(b).
3. ☐ This application is being forwarded to Abandoned Files Unit in view of:
 - a. ☐ The letter of express abandonment which is in compliance with rule 138.
 - b. ☐ Applicant's failure to file the response received _____ within the period set.
4. ☒ All of the claims being allowable, prosecution on the merits is closed in this application and the Notice of Allowance or other appropriate communication will be sent in due course, in view of:
 - a. ☒ Applicant's communication filed Aug 27, 1973
 - b. ☐ Telephone interview with _____ on _____
 - c. ☐ Personal interview with _____ on _____
 - d. ☒ An Examiner's Amendment will follow.
5. ☐ Receipt is acknowledged of papers submitted under 35 U.S.C. 119 which papers have been made of record in the file.
6. ☐ Other _____

H. Ansher
HAROLD ANSHER
EXAMINER
GROUP ART UNIT 164

PLAINTIFFS' EXHIBIT 2



U.S. DEPARTMENT OF COMMERCE
Patent Office

Address Only: COMMISSIONER OF PATENTS
Washington, D.C. 20231

In Reply Please Refer To The Following:		
EXAMINER'S NAME H. Ansher		
164	Oct. 14, 1971	189,188
GR. ART. UN.	FILING DATE	SERIAL NO.
Bill G. James		
APPLICANT		INVENTION
HEAT SENSITIVE NOVELTY DEVICE		

J. Andrew
9-21-73 *C/9*

MAILED

Mailed SEP 27 1973

GROUP 160

TO FACILITATE PROCESSING
THROUGH ISSUE-DO NOT FILE
ADDITIONAL PAPERS UNTIL FORMAL
NOTICE OF ALLOWANCE (POL 85)
HAS BEEN RECEIVED.

John J. Leavitt
777 North First Street
San Jose, Calif. 95112

Please find below a communication from the EXAMINER in charge of this application.

Commissioner of Patents

CHANGES AND/OR ADDITIONS TO THE APPLICATION RECORD MADE BY THE EXAMINER UPON ALLOWANCE

This application is in condition for allowance and the following changes have been made therein by the Examiner. Should the changes be unacceptable to applicant, an appropriate amendment may be proposed after the Notice of Allowance has been received, as provided under Rule 312. To ensure consideration of such an amendment, it must be submitted on or before remittance of the Base Issue Fee.

PROSECUTION ON THE MERITS IS CLOSED. A NOTICE OF ALLOWANCE WILL BE MAILED IN DUE COURSE.

☒ Note attached Notice of References Cited, PO-892, which is part of this communication. The listed references are considered to be pertinent to the claimed invention, but the claims are deemed patentable thereover.

In line 4 of the recitations (c) in claims 16 and 17 "beads" has been changed to--encapsulated droplets-- in each instance, for obvious reasons of uniformity of language in the claims.

Claims 12 and 13 have been cancelled as obviously intended by applicant, since they have been rewritten by applicant as independent claims 16 and 17, respectively.

In the specification, on page 5, line 12--an--has been inserted before "embodiment", for grammatical reasons.

H. Ansher: jnq PLEASE FURNISH YOUR ZIP CODE IN ALL CORRESPONDENCE

(703) 557-3735

FORM POL-37 (REV. 3/70)

H. Ansher
HAROLD ANSHER
EXAMINER

GROUP ART U" 7 174

PLAINTIFFS' EXHIBIT 2

FORM PD-892 REV. 6/71		U. S. DEPARTMENT OF COMMERCE PATENT OFFICE		SERIAL NO. 189188	GROUP ANT UNIT 164	ATTACHMENT TO PAPER NUMBER 9
NOTICE OF REFERENCES CITED				APPLICANT(S) JAMES, B. G.		
<input type="checkbox"/> Check here if this is a supplemental citation. (Do not prepare an additional folio.)						
U. S. PATENTS						
	PATENT NO.	DATE	PATENTEE	CLASS	SUB- CLASS	FILING DATE APPROPRIATE
A	2,202,311	3-11-42	CARLIS (L. Sch)	23	9	8-21
B						
C						
D						
E						
F						
G						
H						
I						
J						
K						
FOREIGN PATENTS OR PUBLISHED APPLICATIONS						
	PATENT NO.	DATE	COUNTRY	NAME	CLASS	SUB- CLASS
L						
M						
N						
O						
P						
Q						
OTHER REFERENCES (Including Author, Title, Date, Pertinent Pages, Etc.)						
R						
S						
T						
U						
EXAMINER	ANSHER, H.			DATE	9-14-23	
				<input type="checkbox"/> CHECK HERE IF FOREIGN EXCHANGE		
• ATTENTION R.O.B.: Do not furnish copy if this box is checked.						

PLAINTIFFS' EXHIBIT 2

U.S. Department of Commerce
Patent Office

BASE ISSUE FEE TRANSMITTAL

1. This form is to be used in lieu of a formal transmittal and should be used for transmitting the Base Issue Fee. Items numbered 1 through 4 below should be completed as appropriate. The Base Issue Fee Receipt will be mailed to the address appearing in item 4a below.

2. The COMMISSIONER OF PATENTS is requested to apply the Base Issue Fee to the patent identified below and deliver the patent as indicated.

3. For printing on the patent front page: List below the names of not more than 3 registered patent attorneys or agents OR, alternatively, the name of a firm having as a member a registered attorney or agent. If no name is listed below, no name will be printed.

(Signature of party in interest of record) *John J. Leavitt* (Date) *1/11/74*

1 *John J. Leavitt*

2

3

NOTE: The Base Issue Fee will not be accepted from anyone other than the applicant, his assignee or attorney, or a party in interest as shown by the records of the Patent Office, nor will this fee be accepted in the application prior to the notice of Allowance.

FILING DATE	SERIAL NO.	NO. OF CLAIMS ALLOWED	EXAMINER AND GROUP ART UNIT
10/14/71	189188	7	Anshew 164
APPLICANT(S)			
James, Bill G.; Redwood, Giff.			
TITLE OF INVENTION (X indicates as amended by examiner)			
Heat sensitive novelty device			MAILED Oct. 19, 1973
BASE FEE COMPUTATION			NOTICE OF ALLOWANCE DATE
\$100.00	\$4 (FOR DWS. FEE PER SHEET) x \$10 (FOR FIRST PAGE PRINTED SPEC)	BASE FEE DUE	CLASS-SUB
		\$114	161/005,000
2. ASSIGNMENT DATA (print or type)			3. BASE FEE ENCLOSED:
A. The appropriate box(es) in this item MUST be checked:			<input checked="" type="checkbox"/> YES <input type="checkbox"/> NO
(1) <input checked="" type="checkbox"/> This application is NOT assigned;			Charge to my Deposit Account Number: _____ (POL \$50 must be enclosed)
(2) <input type="checkbox"/> This application IS assigned;			
(3) <input type="checkbox"/> Assignment herewith;			
(4) <input type="checkbox"/> Assignment recorded and returned by Patent Office.			
			<input type="checkbox"/> For Base Fee. <input type="checkbox"/> For Balance of Issue Fee Due, if any. <input type="checkbox"/> For Forwarding Enclosed Assignment.
B. For printing on the patent: (Unless an assignee is identified below, the patent will issue to the applicant above-named. Completion of this item, however, is NOT a substitute for filing the assignment as required in Rule 334)			
(1) NAME OF ASSIGNEE:			
(2) ADDRESS: (City & State or Country)			
			DO NOT USE THIS SPACE.
			4 106 100.00CK
			4 107 10.00CK
(3) STATE OF INCORPORATION, IF ASSIGNEE IS A CORPORATION:			4 108 4.00CK

NOTE: All further correspondence, the patent together with the Notice of Balance of Issue Fee Due, if any, will be mailed to the addressee entered in the stub marked 4 at the lower left below, unless you direct otherwise by specifying the appropriate name and address in item 4a below right.

4a. Further correspondence is to be mailed to the following:

PLAINTIFFS' EXHIBIT 2

All communications regarding this application should give the serial number, date of filing, and name of the applicant.



U.S. DEPARTMENT OF COMMERCE
Patent Office

Address Only: COMMISSIONER OF PATENTS
Washington, D.C. 20231

NOTICE OF ALLOWANCE AND BASE ISSUE FEE DUE

The application identified below has been examined and found allowable for issuance of Letters Patent.

EXAMINATION DATE	10/14/71	SERIAL NO.	189168	NO. OF CLAIMS ALLOWED	7	EXAMINER AND GROUP ART UNIT	Ansher 164
APPLICANT(S)	James, Bill G.; Redwood City, Calif.						MAILED Oct. 19, 1973
TITLE OF INVENTION (As indicated by examiner)	Heat sensitive novelty device						
BASE FEE COMPUTATION				BASE FEE DUE		CLASS-SUB	
000	\$4	(FOR DWG. @ \$2 PER SHEET)	\$10	(FOR FIRST PAGE PRINTED SPEC.)	\$114	161/005.000	

The complete Issue Fee is one hundred dollars (\$100) plus two dollars (\$2) for each sheet of drawing, plus ten dollars (\$10) for each printed page of specification (including claims) or portion thereof.

Inasmuch as the final number of printed pages cannot be determined in advance of printing, an initial BASE ISSUE FEE (consisting of the fee for printing the first page of specification (\$10) plus the fee of (\$2) for each sheet of drawing, added to the fee of \$100) must be paid within three months from the date of this notice, or the application shall be regarded as ABANDONED.

When remitting said Base Issue Fee, enclosed Form POL-85b should be used, and if use of a Deposit Account is being authorized, POL-65c should also be forwarded.

The Base Issue Fee will not be accepted from anyone other than the applicant, his assignee, attorney, or a party in interest as shown by the records of the Patent Office.

If an assignment has not been previously filed and it is desired to have the patent issue to the assignee, the assignment must be received in this Office with the recording fee together with the Base Issue Fee. In any event, the appropriate space(s) under "Assignment Data" on POL-85b must be completed. Where there is an assignment, the assignee's address must be given to ensure its inclusion in the printed patent.

In connection with the address of the inventor(s), attention is directed to Form POL-231 enclosed.

A Notice of Balance of Issue Fee Due will be mailed together with the patentee's copy of the patent if an additional fee is due. Payment must be made within three months from the date shown on said Notice since FAILURE TO PAY THIS BALANCE WITHIN THE TIME SPECIFIED WILL RESULT IN LAPSE OF THE PATENT.

W. J. Anthony

IMPORTANT

ATTENTION IS DIRECTED TO RULE 334
REVISED NOVEMBER 4, 1969.

THE PATENT WILL ISSUE TO APPLICANT
UNLESS AN ASSIGNEE IS SHOWN IN
ITEM 2 ON FORM POL-85b, ATTACHED

John J. Leavitt
777 North First St.
San Jose, Calif. 95112

PATENT OFFICE COPY dkm 599

PLAINTIFFS' EXHIBIT 2

PATENT NUMBER		CROSS REFERENCE	
SERIAL NUMBER		(List in numerical sequence)	
189188 ✓		CLASS	SUBCLASS
NAME		23	230LC
JAMES, B. J.		40	28R
CLASS		161	6139
SUBCLASS		161	Digest 5
161	5 ✓	161	410
GROUP		252	408
ART UNIT		350	162R
PLEASE PRINT FULL NAME		INTERNATIONAL CLASSIFICATION	
ASSISTANT EXAMINER		B4479/08	
PRIMARY EXAMINER		B01G13/02	
164		101	
FORM PG-270 REV. 2-701		U.S. DEPARTMENT OF COMMERCE PATENT OFFICE	

ISSUE CLASSIFICATION SLIP



PLAINTIFFS' EXHIBIT 2

RECEIVED
SEP 10 1973
GROUP 160

In re application of BILL G. JONES
Serial No. 189,188
Filed October 14, 1971
For HEAT SENSITIVE NOVELTY DEVICE

THE COMMISSIONER OF PATENTS
Washington, D.C. 20231

Sir:

Transmitted herewith is an amendment in the above-identified application.

- ☐ No additional fee is enclosed because this application was filed prior to October 25, 1965 (effective date of Public Law 89-83.)
- ☐ No additional fee is required.

The fee has been calculated as shown below.

CLAIMS AS AMENDED						
(1)	(2) CLAIMS REMAINING AFTER AMENDMENT	(3)	(4) HIGHEST NO. PREVIOUSLY PAID FOR	(5) PRESENT EXTRA	(6) RATE	(7) ADDITIONAL FEE
TOTAL CLAIMS	* 7	MINUS	** 13	= 0	x \$2	x 0
INDEP. CLAIMS	* 5	MINUS	1	= 4	x \$10	40.00
TOTAL ADDITIONAL FEE FOR THIS AMENDMENT →					\$ 40.00	

*If the entry in Column 2 is less than the entry in Column 4, write "0" in Column 5.

**If the "Highest Number Previously Paid For" IN THIS SPACE is less than 10, write "10" in this space.

- ☒ A check in the amount of \$ 40.00 is attached.
- ☐ Charge \$ _____ to Deposit Account No. _____. A duplicate copy of this sheet is enclosed.

Please charge any additional fees or credit overpayment to Deposit Account No. _____. A duplicate copy of this sheet is enclosed.

John J. Leavitt
Attorney of Record

PLAINTIFFS' EXHIBIT 2



RECEIVED

MAY 21 1973

GROUP 160

In application of BILL G. JAMES
 Serial No. 189,188
 Filed October 14, 1971
 For HEAT SENSITIVE NOVELTY DEVICE

THE COMMISSIONER OF PATENTS
 Washington, D.C. 20231

Sir:

Transmitted herewith is an amendment in the above-identified application.

- ☐ No additional fee is enclosed because this application was filed prior to October 25, 1965 (effective date of Public Law 89-83.)
- ☒ No additional fee is required.

The fee has been calculated as shown below.

CLAIMS AS AMENDED						
(1)	(2) CLAIMS REMAINING AFTER AMENDMENT	(3)	(4) HIGHEST NO. PREVIOUSLY PAID FOR	(5) PRESENT EXTRA	(6) RATE	(7) ADDITIONAL FEE
TOTAL CLAIMS	*	MINUS	**	=	X \$2	X
INDEP. CLAIMS	*	MINUS		=	X \$10	X
				TOTAL ADDITIONAL FEE FOR THIS AMENDMENT →		

*If the entry in Column 2 is less than the entry in Column 4, write "0" in Column 5.

**If the "Highest Number Previously Paid For" IN THIS SPACE is less than 10, write "10" in this space.

- ☐ A check in the amount of \$ _____ is attached.
- ☐ Charge \$ _____ to Deposit Account No. _____. A duplicate copy of this sheet is enclosed.

Please charge any additional fees or credit overpayment to Deposit Account No. _____. A duplicate copy of this sheet is enclosed.

John J. Leavitt
 Attorney of Record

PLAINTIFFS' EXHIBIT 2

FORM PO-875 (10-68)		U. S. DEPARTMENT OF COMMERCE PATENT OFFICE		SERIAL NUMBER	FILING DATE	
PATENT APPLICATION FEE DETERMINATION RECORD				189,188	10-14-71	
				APPLICANT (First Named Only) (James)		
CLAIMS AS FILED - PART I						
(1) FOR	(2) NUMBER FILED	(3) NUMBER EXTRA	(4) RATE	(5) BASIC FEE \$65.00		
TOTAL CLAIMS	13 - 10 =	3 =	= \$2.00	6		
INDEPENDENT CLAIMS	1 - 1 =	- =	= \$10.00	-		
				TOTAL FILING FEE →	71.00	
CLAIMS AS AMENDED - PART II						
(1)	(2) CLAIMS REMAINING AFTER AMENDMENT	(3)	(4) HIGHEST NO. PREVIOUSLY PAID FOR	(5) PRESENT EXTRA	(6) RATE	(7) ADDITIONAL FEE
AMENDMENT A	TOTAL	* 13	MINUS	** 13	=	= \$2
	INDEP.	* 1	MINUS	1	=	= \$10
	TOTAL ADDITIONAL FEE FOR THIS AMENDMENT →				2	
AMENDMENT B	TOTAL	* 9	MINUS	** 13	=	= \$2
	INDEP.	* 5	MINUS	1	= 4	= \$10
	TOTAL ADDITIONAL FEE FOR THIS AMENDMENT →				40.00 pd	
AMENDMENT C	TOTAL	*	MINUS	**	=	= \$2
	INDEP.	*	MINUS		=	= \$10
	TOTAL ADDITIONAL FEE FOR THIS AMENDMENT →					
AMENDMENT D	TOTAL	*	MINUS	**	=	= \$2
	INDEP.	*	MINUS		=	= \$10
	TOTAL ADDITIONAL FEE FOR THIS AMENDMENT →					

* If the entry in Column 2 is less than the entry in Column 4, write "0" in Column 5.
 ** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 10, write "10" in this space.

The "Highest Number Previously Paid For" ("Total" or "Indep.") is the highest number found in the appropriate box in Column 2.

PLAINTIFFS' EXHIBIT 2

189100



Case Docket No. 1719

THE COMMISSIONER OF PATENTS
Washington, D.C. 20231

Sir:

Transmitted herewith for filing is the patent application of

Inventor: BILL G. JAMES

For: HEAT SENSITIVE NOVELTY DEVICE

Enclosed are:

☒ 2 sheets of drawing.☐ An assignment of the invention to _____☐ A certified copy of a _____ application.☐ Associate power of attorney.

CLAIMS FILED					
(1) FOR	(2) NUMBER FILED	(3) NUMBER EXTRA	(4) RATE	(5) BASIC FEE \$65.00	
TOTAL CLAIMS	13 - 10 =	3	X \$2.00	6.00	
INDEPENDENT CLAIMS	1 - 1 =	0	X \$10.00	-	
TOTAL FILING FEE →				\$71.00	

☐ Please charge my Deposit Account No. _____ in the amount of \$_____. A duplicate copy of this sheet is enclosed.

☐ The Commissioner is hereby authorized to charge any additional fees which may be required, or credit any overpayment to Account No. _____. A duplicate copy of this sheet is enclosed.

☒ A check in the amount of \$71.00 to cover the filing fee is enclosed.

John J. Leavitt
Attorney of Record
JOHN J. LEAVITT

PLAINTIFFS' EXHIBIT 2A.

United States Patent

3,585,331

[72] Inventors: Theodore L. Hodson
Bellbrook;
James V. Cartmell, Dayton; Donald
Churchill, Kettering; Joe W. Jones, Dayton,
all of Ohio

[21] Appl. No. 815,652

[22] Filed Apr. 14, 1969

[45] Patented June 15, 1971

[73] Assignee: The National Cash Register Company
Dayton, Ohio

[56] References Cited

UNITED STATES PATENTS

3,265,600	8/1966	Jensen	252/316
3,351,943	11/1967	Bonn	250/651X
3,401,262	9/1968	Ferguson et al.	250/83

Primary Examiner—James W. Lawrence
Assistant Examiner—A. L. Birch
Attorneys—E. Frank McKinney and Joseph P. Burke

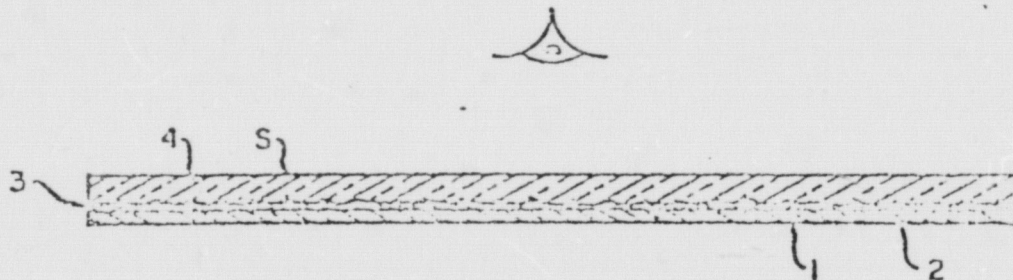
[54] ENCAPSULATED CHOLESTERIC LIQUID
CRYSTAL DISPLAY DEVICE
15 Claims, 3 Drawing Figs.

[52] U.S. Cl. 250/47,
117/69, 161/410, 250/83, 252/408, 350/160

[51] Int. Cl. G01h 21/60

[50] Field of Search 250/65.1,
83, 47; 117/69; 252/408; 161/4, 410; 106/21;
350/160 LC; 23/230 LC

ABSTRACT: The present disclosure is directed to articles of manufacture, e.g., display devices, having an encapsulated liquid-crystal member of enhanced color purity, color contrast and visual resolution due to an overlying essentially transparent top layer having a substantially smooth exterior surface. This essentially transparent layer has an index of refraction which approximates that of the capsule cell wall material and any polymeric or other binder used in conjunction with the encapsulated liquid crystals in the encapsulated liquid crystal layer or member.



PATENTED JUN 15 1971

3,585,381

FIG. 1

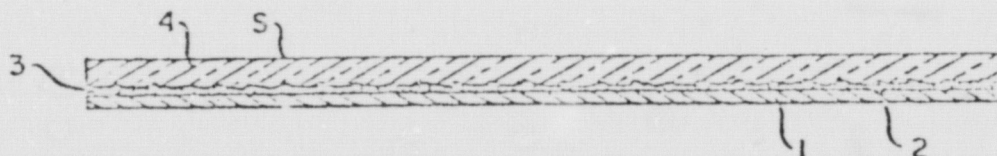


FIG. 2

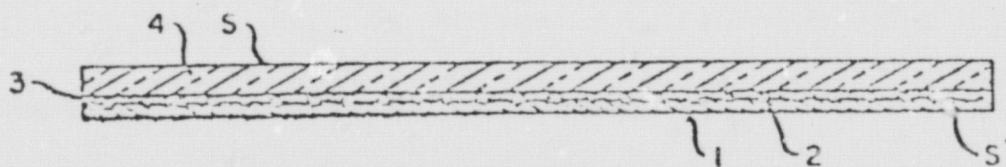
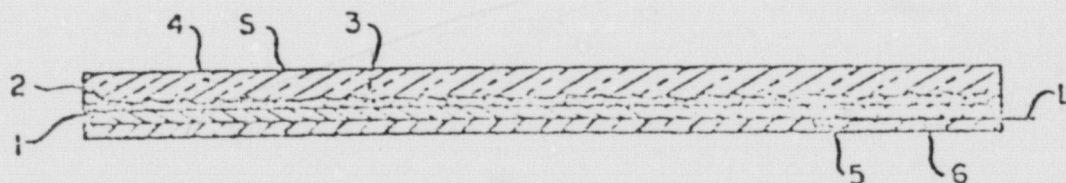


FIG. 3



INVENTORS
THEODORE L. HODSON
JAMES V. CARTMELL
DONALD CHURCHILL &
JOE W. JONES

BY *E. Frank McKinney*
Joseph P. Burke
THEIR ATTORNEYS

1

2

ENCAPSULATED CHOLESTERIC LIQUID CRYSTAL
DISPLAY DEVICE

Prior to the present invention, the color-change behavior of liquid crystals, esp. those of the cholesteric type, when subjected to the stimulus of heat or an electric field was known. Of course, the exact color changes and the level of thermal energy or electric field input required to effect a given color change are dependent upon the specific liquid crystal composition selected. The ability of cholesteric liquid crystals, per se, to undergo such thermal changes suggests their use in thermal imaging and display devices, e.g., as noted in U.S. Pat. Nos. 3,114,326, 3,401,262 and 3,410,999. The same may be said of their known color response when an electric field is imposed on the liquid crystals.

While such phenomena were interesting and theoretically capable of utilization in thermal imaging and other data display applications, several vexatious problems attended the use of coating compositions containing unencapsulated cholesteric liquid crystals. The liquid crystal is characteristically a viscous liquid and films are easily damaged or removed by contact. In addition, atmospheric dust and other airborne particles (present in normal concentrations) adhere to the film causing a deterioration in the color-scattering properties. Also, there is a critical relation between the compositional purity of the material and the ability to reproduce color within a well-defined temperature range. Absorption of certain organic vapors in very small concentrations can alter the color-temperature relation. In some liquid crystal compositions certain constituents are prone to crystallize and in so doing, the material balance is altered by zone refining. This results in films of nonuniform color. All of these factors limit the useful life of the liquid crystal film.

A significant improvement enabling the more practical utilization of liquid crystals occurred when it was discovered that liquid crystals, esp. those of the cholesteric type, could be protected from such degradative influences by encapsulation, without detracting from the ability to coat or otherwise apply liquid crystals in any manner which they could previously be used. Hence, their usable life was greatly increased without in any way narrowing the flexibility in use. The encapsulation of cholesteric liquid crystals is the subject of U.S. Pat. application Ser. No. 618,751 filed in the names of Donald Churchill, James V. Cartmell and Robert E. Miller on Feb. 27, 1967. Similar subject matter is found in French Pat. specification No. 1,527,432 and South African Pat. specification No. 3016/67.

The encapsulation of such liquid crystals greatly enhanced the practicality of using liquid crystals to monitor temperature changes, for data display devices, etc. However, the encapsulated liquid crystals, when applied in a suitable manner, viz., in the form of a coating with or without additional binder, has a duller visually observed color content and a reduced visual contrast upon subjection to thermal or electric field stimulus compared to freshly prepared unencapsulated liquid crystal material of identical composition. In short, the encapsulated liquid crystals had diminished color purity, and the color produced was not sufficiently distinguishable from the background unstimulated regions to satisfy aesthetic requirements for display devices. Also, it was observed that the angular dependency of color was less with encapsulated liquid crystals than unencapsulated liquid crystals of the same composition. These problems of reduced color purity and contrast are largely overcome by utilization of the structure of the present invention which involves an essentially transparent, substantially smooth (on the viewing, usually upper, surface) layer which is in direct contact with the layer containing the encapsulated liquid crystals, said transparent smooth-surfaced layer having an index of refraction which is close to that of the material employed as the capsule cell wall and the binder used in the encapsulated liquid crystal layer.

It was surprising that the utilization of such a transparent, smooth-surfaced layer would improve the color purity and color contrast of the encapsulated liquid crystals. While said layer also provides additional protection for the liquid crystals, e.g., from dust, moisture, etc.; its use as a protective layer would not be justified from a practical point of view because the cell wall introduced by encapsulation performs this function of protecting the identity and integrity of the liquid crystal composition adequately. Also, the use of a binder assists in locating and evenly distributing the encapsulated liquid crystals on the substrate. Furthermore, it was not apparent that by putting more of a transparent barrier between the liquid crystal, per se, and the viewer (that is in addition to the capsule cell wall and binder) that the color purity, brightness and color contrast could be significantly upgraded. Quite surprisingly, however, the utilization of the transparent, smooth-surfaced layer in direct contact with the encapsulated liquid crystal layer throughout substantially the entire extent or surface thereof let to significant improvements in color purity, contrast and visual resolution compared to the previous encapsulated liquid crystal-containing display articles. Also, it was observed that the angular dependency of color of the encapsulated liquid crystal articles having a brightness improving top layer was greater than that of such articles having no top layer. The present invention overcomes the chief drawbacks previously associated with the use of encapsulated liquid crystal display films.

From one facet the present invention can be viewed as a structural improvement wherein an essentially transparent surface (top) layer having a substantially smooth exterior surface is in direct contact at its interior (innermost) surface with an encapsulated liquid crystal layer (which can have an opaque background) throughout substantially the entire extent of said encapsulated liquid crystal layer and in which the index of refraction of said top layer, the capsule cell wall and any binder present in the encapsulated liquid crystal layer lies within the range of from about 1.40 to about 1.70. Both the exterior (closer to viewing agency) and interior major surfaces of said top layer can be smooth and the best brightness is apparently secured when both said surfaces are smooth.

The term "smooth" as used herein means that the average ratio of the horizontal distances or lengths (L) between crests (high points) on the outermost (exterior) surface divided by the vertical distance (D) between said crests and troughs (low points) on the outermost surface is at least 4.0, viz., $L/D \geq 4.0$. When the articles of this invention are formed by topcoating procedures, some of the crests can be the tops of capsules which protrude through the polymer topcoat whereas other crests can be the polymer topcoat as it overlies capsules lying underneath. Usually, the depth of surface irregularities is small in comparison to the size (diameter) of the capsules, and the undulations are generally continuously variable rather than sharply discontinuous, e.g., as is experienced when no top layer is present such as occurs when a capsule layer (encapsulated liquid crystals plus binder) is the outermost surface.

Three embodiments illustrating the present invention are shown in the drawings. FIGS. 1 to 3 are cross-sectional views showing composite display film structures utilizing the improved features of the present invention.

In FIG. 1 there is shown an opaque, e.g., black, background layer, 1, which can be a preformed opaque film or a substrate film having a black coating, e.g., ink, on its upper or lower surface. The opaque film, 1, has on its upper surface an overlying layer formed of a plurality and more accurately a profusion of individual encapsulated liquid crystals, 2, (or clusters of such individual encapsulated liquid crystals) located in association with a polymeric binder, 3, which assists in retaining the capsules in substantially uniform distribution on the opaque substrate. The essentially transparent top layer, 4, overlies and is in direct contact with the encapsulated liquid crystal layer throughout substantially its entire extent and has a smooth outer viewing (upper) surface, 5, as illustrated in FIG. 1. The

article of FIG. 1 can be made conveniently by applying an emulsion coating of encapsulated liquid crystals and binder to a paper or plastic substrate, e.g., Mylar, previously painted black. When the encapsulated liquid crystal layer has fully dried, a transparent polymer topcoat 4, having an essentially smooth upper surface can then be applied thereto. While FIGS. 1 and 3 show outermost surface S of top layer 4 to be quite flat, it will be realized that the top coating procedure will result in some undulations as the top coating tends to assume in part the contours of the underlying capsules. These surfaces are "smooth" however, as defined above. When the top layer is formed by topcoating, the underlying substrate can be paper, wood or any nontransparent material, such as metal foil, e.g., aluminum foil; plastic, e.g., poly(tetrafluoroethylene) "Teflon," etc.

In the article shown in FIG. 2 the encapsulated liquid crystal-binder is applied as a slurry or emulsion by coating onto a sheet or layer, 4, of transparent material, e.g., organic plastic, e.g., polycrylate or silicone polymer, or inorganic material. Top layer, 4, is smooth on both its upper (exterior) and lower (interior) surfaces, S and S', respectively, and is of substantially the same thickness throughout. This structure can be secured readily by use of preformed sheets, e.g., of polished plate glass or plastic having substantially smooth surfaces. In the case of the FIG. 2 device, the transparent smooth top layer, 4, is inverse coated (on surface, S') with the encapsulated liquid crystal-binder composition and the coating is allowed to dry thoroughly. Surface S', then becomes the interface between glass or plastic and encapsulated liquid crystals. Then this encapsulated liquid crystal layer is overcoated with a black or other opaque coating, 1, to aid in viewing the color change by incident light upon thermal and/or electric field stimulus. The thus formed device (article) is then inverted for viewing through transparent layer, 4, as shown in FIG. 2. The exterior (lower) surface of background layer, 1, can be either smooth or uneven as the case may be since it has nothing to do with the visual contrast and optical purity of the image observed through the transparent smooth surface layer 4.

The article of FIG. 3 is formed by topcoating and hence is like that of FIG. 1, but it additionally includes one or more electrically conductive resistor heater element(s), 5, deposited on substrate 1 or at least positioned in thermally responsive communication with encapsulated liquid crystals 2, e.g., by conduction, convection or radiation. Electric lead(s), L, can be connected to a source of current, not shown. Optionally, there can also be included a base or insulating substrate 6.

While it will be observed that in all cases as shown in the drawings, the top layer and encapsulated liquid crystal layer are separate and distinct, the encapsulated liquid crystal layer can be deposited in any desired configuration or design both linear and nonlinear (curved), e.g., by stenciling, silk screening, gravure roll printing, etc. Hence, when it is stated that the smooth top layer is in direct contact with the encapsulated liquid crystal layer throughout substantially the entire extent thereof, this can mean only a portion of the entire upper surface of the display, viz., the encapsulated liquid crystal printed portion. Polychromatic displays can be attained by use of different mixtures of liquid crystals coated in one or more layers on different areas of the encapsulated liquid crystal layer. Some areas can be coated in an overlapped manner with a plurality of different encapsulated liquid crystal compositions to aid in obtaining color effects not readily obtainable by use of a single encapsulated liquid crystal composition. Of course, the utilization of encapsulated liquid crystals enables different liquid crystal compositions (yielding various colors at the same temperature) and printed configurations thereof to be used in positionally close association in various regions of the same display article without destroying the compositional integrity of each composition.

The improved structure of this invention can be employed whenever encapsulated liquid crystals are utilized in order to enhance the color contrast and purity of the color visually ob-

served due to the presence of the encapsulated liquid crystals. Thus, its use is equally feasible in the case of both electric field effect and thermal detection or display devices (e.g., where the heat is generated due to electrical resistors such as at 5 in FIG. 3).

As previously noted, the index of refraction of the smooth-surfaced, transparent top layer is usually close to that of the material employed to form the capsule cell wall and also that of the polymer or other material employed to serve as binder in the encapsulated liquid crystal layer. Usually the index of refraction of the top layer, binder and cell wall ranges from about 1.40 to about 1.70. More usually, the index of refraction of the top layer ranges from about 1.45 to about 1.60, preferably from about 1.48 to 1.59 and more preferably between about 1.50 and 1.54.

When the top layer is plastic, it can be produced from a wide variety of essentially transparent natural and synthetic organic materials, such as polyolefins, e.g., polyethylene, polypropylene, polybutylenes; polyesters, e.g., polyethylene glycol terephthalate; acrylic resins, e.g., polyalkyl acrylates and methacrylates, such as polymethylacrylate, polyethylacrylate, polymethylmethacrylate, polybutylmethacrylate, polystyrene; polyvinylidene chloride homo- and copolymers e.g., "Saran" materials, nylons and other polyamides; polyvinyl aldehydes, e.g., polyvinyl formaldehyde, polyvinyl butyraldehyde; copolymers of mono-olefinically unsaturated monomers with vinyl esters, such as ethylene-vinyl acetate copolymers; cellulosic plastics, e.g., cellulose acetate, ethyl cellulose; polycarbonates; polyurethanes; silicone resins, polyalkyl siloxanes, e.g., polymethyl siloxane; alkyd resins and varnishes, and other polymers and resins.

Under certain circumstances it is preferable to employ a polymer which can be deposited, e.g., cast from an organic, water-immiscible solvent since the presence of water could partially dissolve the capsular cell wall and impair the quality thereof, viz., with respect to the encapsulated cholesteric liquid crystal member. In any event, when depositing the transparent, smooth-surface film, 4, while employing water or a water-miscible solvent, care should be exercised to avoid exposure of the capsules for extended periods of time to a solvent which is also a solvent for a capsule wall material.

While organic plastic materials, e.g., polymeric materials, have been mentioned hereinabove for use in conjunction with the transparent, smooth-surfaced top layer 4, other materials, e.g., inorganic materials such as glass (e.g., conventional soda lime-silica glasses), alkali metal silicates such as sodium silicate, potassium silicate, etc., can be employed.

Instead of forming the top layer by overcoating the encapsulated liquid crystal layer (as shown in FIGS. 1 and 3), preformed films, layers or sheets of organic or inorganic material can be used via inverse coating to constitute top layer 4, e.g., as noted in conjunction with the description of the article of FIG. 2. The thickness of the top layer 4 can be varied widely from approximately 10 microns to one-eighth inch or greater, e.g., in the case of glass sheets of polished plate glass where a one-eighth inch thickness has been utilized quite satisfactorily.

LIQUID CRYSTAL MATERIALS

The term "liquid crystal," as used herein, is employed in the generic, art-recognized sense to mean the state of matter often referred to as a mesophase, wherein the material exhibits flow properties associated with a liquid state but demonstrates long range ordering characteristics of a crystal. The term "cholesteric liquid crystal" refers to a particular type of mesophase most often demonstrated by esters of cholesterol. Many of the cholesteric liquid crystals exhibit a reflective scattering of light giving them an iridescent appearance. In addition to using individual liquid crystal compounds, the encapsulated cholesteric liquid crystalline layer can be and usually is comprised of a mixture of two or more such compounds. The encapsulated cholesteric liquid crystal layer, itself, can be

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comprised of a plurality (and usually a predominate) of capsules containing the same or different cholesteric liquid crystal composition. Suitable individual cholesteric liquid crystal materials and mixtures which exhibit chromatic response to varying temperatures include, but are not limited to, the following: cholesteryl nonanoate, cholesteryl chloroate, cholesteryl nonanoate and cholesteryl bromide; cholesteryl nonanoate, cholesteryl bromide and cholesteryl cinnamate; cholesteryl nonanoate, cholesteryl iodide and cholesteryl cinnamate; cholesteryl nonanoate, cholesteryl iodide and cholesteryl benzoate; cholesteryl nonanoate, cholesteryl chloride and oleyl cholesteryl carbonate; cholesteryl nonanoate, cholesteryl chloride and oleyl cholesteryl carbonate and cholesteryl bromide; oleyl cholesteryl carbonate and cholesteryl iodide; oleyl cholesteryl carbonate and cholesteryl p-chlorobenzoate; etc.

Also, it should be understood that included within the term cholesteric liquid crystalline mixtures are mixtures of two or more individual materials, one or more of which individually does not form a cholesteric liquid crystal phase but which in admixture exhibit a cholesteric liquid crystal phase. Hence, one or more materials which individually are not cholesteric liquid crystals can be employed in accordance with this invention if, when in admixture, they do exhibit cholesteric liquid crystal behavior, viz., they form a mesophase which demonstrates the property of reflection (light scattering). One such mixture is cholesteryl nonanoate, oleyl cholesteryl carbonate and cholesterol. The latter material, by itself, does not form a cholesteric liquid crystalline phase, but cholesterol does form a chromatically responsive mesophase in combination with the other materials.

Various natural and synthetic polymeric materials can be employed to constitute the polymeric binder matrix of the encapsulated cholesteric liquid crystal layer. Any transparent or substantially transparent polymeric material having an index of refraction in the range set forth hereinabove can be used. Suitable polymeric materials for this purpose include, but are not limited to, the following: acrylates, polyalkyl acrylates and methacrylates, e.g., polymethyl acrylate, polyethyl acrylate, polymethyl methacrylate, etc.; polyvinyl alcohol, gelatin, latex (natural rubber and synthetic rubber latexes), zein, polyethylene homo- and copolymers, polypropylene homo and copolymers; and any of the materials mentioned above as suitable top layer materials. The encapsulated cholesteric liquid crystals can be associated intimately with the polymer matrix in a variety of ways. For example, the capsules can be deposited onto a polymer film, e.g., as a coating simply by spraying from a dispersion or emulsion of the encapsulated liquid crystal in a binder.

ENCAPSULATION PROCEDURES

A wide variety of procedures can be employed to adequately prepare capsules and liquid crystalline layers containing the encapsulated liquid crystals. The capsule diameters can vary from about 2 to about 1,000 microns or more, but usually capsule diameters range in size from about 5 to about 500 microns and preferably from about 15 to 30 microns. The 20 to 25 micron size capsules are more preferred due to their uniform constancy, color properties and resolution characteristics. One satisfactory method of preparing capsules suitable for containing liquid crystal materials is disclosed in U.S. Pat. No. 2,800,457 issued on July 23, 1957, to Barrett K. Green and Lowell Schleicher. While the aforementioned capsule preparation system is sometimes preferred, it should be understood that the capsule products employed in this invention can be obtained by any of the many later developed encapsulation procedures which are capable of producing capsules of the desired size required for a given use. The final size of the capsules intended to be used is preferably 20 to 25 microns in diameter. But it has been found that virtually any size of capsules can be successfully utilized, the larger capsules showing a more distinct and extended color display.

When used, e.g., in a data display system. While U.S. Pat. No. 2,800,457 discloses a pioneer invention concerning encapsulation on a minute scale, reference is also made to application for U.S. Pat. Ser. No. 544,023, filed Oct. 31, 1965, which is a continuation of U.S. Pat. application Ser. No. 137,942, filed Sept. 14, 1961, by Carl Heycock et al., which application discloses a procedure for making larger than microcapsule capsules. This same procedure is also disclosed in the corresponding British Pat. No. 935,312. While the foregoing encapsulation procedures are chemical in nature, it should be realized that mechanical encapsulation procedures (as well as other chemical procedures) can be used to make the liquid crystal capsules. Further details concerning satisfactory procedures can be obtained in "Microencapsulation" by Anderson et al., published by Management Reports, Boston, Mass. (1963), the entire disclosure of which is incorporated herein by reference.

Another feature of the incorporation of encapsulated cholesteric liquid crystalline materials into a sensing or display system is the utilization of a mixture of capsules, as to size and content, for indicating and/or displaying a wide range of specific levels of temperature. Such a system, in one case, can comprise a plurality of layers, or area. In the same layer, each comprising one, two or more types of capsules having different mixtures of chromatically responsive cholesteric liquid crystalline materials. These devices can be tailor-made to accomplish a desired task by adjustment of characteristics imparted thereto by any one or more of the following variables: (a) temperature response range of the encapsulated liquid crystal material used, (b) size of the liquid crystal core; (c) type and thickness of the capsule cell wall material, (d) specific composition of the liquid crystalline material, and the like, all to the purpose of choosing a response suitable for a given proposed use or product.

In accordance with this invention capsules can be prepared which contain from about 50 to about 99 weight percent of internal phase payload (cholesteric liquid crystal material) with the remainder being cell wall material. Usually, however, the internal phase represents from about 70 to about 95 weight percent of the total capsule weight.

It is also within the purview of this invention to employ a coloring material to tint the capsule cell wall color. The capsule cell walls thus colored would serve not only as liquid crystal containers but also as color filters for the light traveling to and from the encapsulated cholesteric liquid crystalline materials. Capsule cell walls are easily tinted by any stain capable of coloring the gelatin-gum arabic or other cell wall material selected for use. Such a controlled system would find use in display devices and other devices where the broad spectrum incident effect (that obtained from the incident light emanating from the encapsulated cholesteric liquid crystalline member) is objectionable for certain uses.

A wide variety of encapsulating (external phase) materials can be employed to encapsulate the cholesteric liquid crystals in accordance with this invention. Such suitable materials include those referred to hereinabove in said U.S. Patents, patent applications, said British Patent and the *Microencapsulation* report. Usually the encapsulating material is one or a combination of the following: a gelatin-gum arabic system, a polyvinyl alcohol-based system, a zein-based system, or phenol-plast or amino-plast condensates, e.g., esterol-formaldehyde, urea-formaldehyde-based systems, etc.

The advantages in color purity (optical spectral purity) and content available by the present invention are evident in the following detailed examples, which are included herein to illustrate rather than to limit the invention. All percentages and parts are by weight unless noted otherwise.

EXAMPLE I (TOP COATING)

The following example illustrates the present invention in which a liquid crystal is encapsulated in a polymer matrix and then coated with a protective layer.

top layer in accordance with this invention whereas the other had no such top layer structure. Both forms of display devices utilized the same electroconductive resistive elements to generate heat and were operated in the same way as thermal mode display devices.

Thin film tantalum-resistive elements were deposited onto a glass substrate by vacuum deposition in conventional manner. The substrate (with resistors) was then coated with an opaque black paint to aid in observing the liquid crystal upon heating. A film of encapsulated liquid crystals with a polyvinyl alcohol binder was then coated over the black film. The encapsulated cholesteric liquid crystal layer was formulated (as specified below) to have a comparatively low color-temperature response, i.e., the scattered color being the same over a fairly wide range of temperature. The capsule layer of the article prepared in accordance with this invention was then overcoated with a transparent acrylic polymer, whereas the comparison article (control) received no top layer.

In operation, the resistive elements were heated by an electric current from a 20-volt potential source and those regions of the encapsulated liquid crystal layer overlying the resistive elements were heated to the isotropic state which is transparent. At this point the black background undercoat becomes visible to yield a black image on a green colored substrate.

A liquid crystal mixture of 70 weight percent cholesteryl nonanoate, 25 weight percent cholesteryl chloride and 5 weight percent cholesteryl cinnamate was prepared and encapsulated in conventional manner using a standard two-way gelatin conservation system. The encapsulation was conducted specifically as follows: into an aqueous solution of 1 weight part of acid-extracted pigskin gelatin (having a Bloom strength of 285 to 305 grams and an isoelectric point of pH 4 to 7) in 12.1 weight parts of distilled water at 55° C. there were placed 13.7 weight parts of said liquid crystal melt. The liquid crystal melt was milled with a shear agitator until the desired particle size was achieved, viz., from 15 to 30 microns. While the milling progressed, an aqueous solution of 1 weight part of gum arabic in 95.6 weight parts of distilled water was prepared in a separate container and maintained at a temperature of 55° C. When the desired particle size is achieved, the gelatin-liquid crystal emulsion is added slowly to the gum arabic solution. The pH is adjusted to 4.55 and the conserve is permitted to cool to 27° C. over a period of two and one-quarter hours. The resultant capsules are cooled to below 15° C. and hardened with 0.5 weight parts of a 25 weight percent aqueous solution of glutaraldehyde for 12 to 15 hours. The resulting capsular slurry was then concentrated by decanting excess water.

Upon completion of encapsulation and subsequent concentration of the slurry, approximately one volume part of a 10 weight percent solution of polyvinyl alcohol in water acts as a binder for the coating mixture forming the encapsulated cholesteric liquid crystal layer. The above emulsion coating was then coated on two glass plates previously provided with resistive heating elements which had in turn been overcoated with black paint (Krylon black lacquer) which was dried prior to application of the ELC layer. Upon drying of the ELC layer a transparent top layer overcoat of a solution of 10 weight percent "Acryloid-B-72" dissolved in benzene was cast over the capsule coating to form the substantially smooth, essentially transparent top layer. "Acryloid-B-72" is a methacrylic acid ester copolymer material characterized by a viscosity of 430 to 640 centipoise in a 40 percent, by weight, solution in toluene at 30° C. The said coating was applied to a wet thickness of approximately 10 mils by a conventional draw down technique. The polymer top layer dried to a clear, substantially smooth, transparent film.

Reflectance measurements were then conducted on both display devices at an angle of incidence of 45° while viewing normal to the plane of the encapsulated liquid crystal film surface. A white standard color calibration target was employed for reference. The color difference in current values, hereinafter

the test was conducted on for the same colorimetric data, are specimens.

Value	Uncoated	Painted
* Reflectance, percent (normal to surface) at 45°	815	821
Contrast ratio (normal to surface) at 45°	78	25
Color difference (normal to surface) at 45°	52	29
Contrast ratio (normal to surface) at 45°	5	22

* Wave length at which the maximum reflection is obtained.

While the essentially transparent, substantially smooth polymer top layer has but little effect on the reflectance maximum of the colored state, a significant and quite visually observable improvement is noted for the contrast ratio. This improvement is believed to be due to elimination of undesirable light scattering from the capsule walls of the encapsulated cholesteric liquid crystals. Decreasing the reflectance band width results in a greater spectral purity and color contrast and hence visual resolution.

EXAMPLE 2 (INVERSE COATING)

A liquid crystal mixture containing 80 weight percent cholesteryl pelargonate, 15 weight percent cholesteryl chloride and 5 weight percent of oleyl cholesteryl carbonate was encapsulated using the same materials and in the same manner specified hereinabove in example 1.

The encapsulated liquid crystal slurry was applied to one major (upper) surface of transparent "Mylar" (polyethylene glycol terephthalate) sheets having thicknesses ranging from approximately 0.5 to 20 mils. The encapsulated liquid crystals were coated uniformly on the upper surface of the "Mylar" substrate from an aqueous dispersion or slurry of 32 weight percent encapsulated liquid crystals, 64.2 weight percent water and 3.8 weight percent of a mixture of polyvinyl alcohol and polyvinyl acetate. The coating weight was 14 to 16 pounds per ream (475,600 square inches). This compares to an average thickness for the ELC layer of 35 to 60 microns.

The coating operation was conducted by screen printing in the following manner: The "Mylar" substrate to be printed upon was laid on a flat surface. A nylon screen, to which a stencilled vinyl back film had been adhered to give the desired printed configuration, mounted on a soft white pine frame, was positioned over the substrate. A supply of capsular ink was then poured on a blacked out region or border of the screen. A neoprene rubber squeegee was used to pull the supply of ink across the screen, at the same time pressing it through the open mesh of the screen. The screen was then lifted from the substrate leaving the capsular ink adhered to the "Mylar."

After the capsular ink had dried, the process was repeated using a 4.4 weight percent black screen process ink to provide the necessary background for the encapsulated liquid crystals attached to the "Mylar." Upon drying of the black opaque background layer, the encapsulated liquid crystal article was inverted thereby allowing a viewer to observe color changes occurring in the encapsulated liquid crystal layer(s) due to changes in temperature (or other equivalent color change inducing forms of energy) when viewed by incident white light through the transparent "Mylar" top layer. The transparent "Mylar" layer, originally serving as substrate for the deposition of the encapsulated liquid crystals, now serves as a brightness enhancing and spectral purity or color intensity improving top layer.

For the specific liquid crystal composition employed in the articles of this example, heating the encapsulated liquid crystal layer to a temperature of 30° to 31° C. results in a red color when illuminated by incident white light at a place of incidence of 6° to 60° and viewed from approximately 9° from the normally incident liquid crystal layer.

What is claimed is:

1. An article of manufacture comprising an encapsulated

PLAINTIFFS' EXHIBIT 2A

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cholesteric liquid crystal layer having an opaque background layer on one surface and a substantially smooth, essentially transparent top layer on the other surface thereof, the interior portion of said top layer being in direct contact with said encapsulated liquid crystal layer throughout substantially the entire extent thereof, wherein said encapsulated cholesteric liquid crystal layer is comprised of a profusion of cholesteric liquid crystal capsules in a polymeric binder and the index of refraction of said binder, top layer and the capsule cell wall material ranges from about 1.40 to about 1.70.

2. An article as in claim 1 wherein at least one electrically conductive resistor heater element is in thermally responsive communication with a portion of said encapsulated cholesteric liquid crystals.

3. An article as in claim 1 wherein said capsules have diameters ranging from about 5 to about 500 microns.

4. An article as in claim 1 wherein said top layer is inorganic.

5. An article as in claim 1 wherein said top layer is an organic plastic.

6. An article as in claim 5 wherein said organic plastic is a polyester. 7. An article of manufacture comprising an encapsulated cholesteric liquid crystal layer comprised of a profusion of cholesteric liquid crystal capsules in a binder having an opaque background layer on one surface and a substantially smooth, essentially transparent top layer of substantially the same thickness throughout on the other surface thereof, the interior portion of said top layer being in direct contact with

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said encapsulated cholesteric liquid crystal layer throughout substantially the entire extent thereof, wherein the index of refraction of said binder, top layer and the capsule cell wall material ranges from about 1.40 to about 1.70.

8. An article as in claim 7 wherein said top layer is glass.

9. An article as in claim 7 wherein said top layer is plastic.

10. An article as in claim 9 wherein said plastic is a polyester.

11. An article as in claim 10 wherein said polyester is polyethylene glycol terephthalate.

12. An article as in claim 9 wherein said plastic is polystyrene.

13. An article of manufacture comprising a substrate having an opaque background layer, an encapsulated cholesteric liquid crystal layer overlying said substrate and a substantially smooth, essentially transparent top layer overlying said encapsulated cholesteric liquid crystal layer, the interior portion of said top layer being in direct contact with said encapsulated cholesteric liquid crystal layer throughout substantially the entire extent thereof wherein said encapsulated cholesteric liquid crystal layer is comprised of a profusion of cholesteric liquid crystal capsules in a polymeric binder and the index of refraction of said binder, top layer and the capsule cell wall material ranges from about 1.40 to about 1.70.

14. An article of manufacture as in claim 13 wherein said substrate is paper.

15. An article of manufacture as in claim 13 wherein said substrate is plastic.

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PLAINTIFFS' EXHIBIT 3A.

WOMEN'S WEAR DAILY, FRIDAY, SEPTEMBER 19, 1975

NOTICE

TO ALL RETAILERS, WHOLESALERS, JOBBERS, MANUFACTURERS
AND DISTRIBUTORS:

Notice that HATTIE CARNEGIE JEWELRY and its subsidiaries have been licensed to manufacture, distribute and sell the sensational new stone that changes color according to the emotions of the wearer. This product and the manufacturing process thereof have been granted a patent by the United States Patent Office. We will rigorously defend our rights under this license, both individually and in consort with the licensor. Immediate, severe legal action will be taken against any retailer, wholesaler or manufacturer who may infringe on this federal patent.

HATTIE CARNEGIE JEWELRY ENTERPRISES, LTD.

10 East 38 Street, New York, N.Y. 10016
(212) 725-2800

PLAINTIFFS' EXHIBIT 3A

Hattie Carnegie, inventor sue Gimbel Bros. on patent.

NEW YORK (FNS) — Hattie Carnegie Jewelry Enterprises, Inc., and an inventor have charged Gimbel Bros., Inc., in a suit here with knowingly selling heat sensitive rings in infringement of Patent No. 3,802,945.

The Federal Court action says the patent was issued to Bill G. James, the inventor who licensed Carnegie to make or have made for it heat sensitive jewelry.

Although Gimbels was told by Carnegie before it ran a notice in WWD that Carnegie would be licensed to sell the jewelry, the department store nevertheless ordered a substantial number of heat sensitive rings from Perry, Ltd., an unlicensed distributor, the suit contends. Then, on Sept. 26, the action says, Gimbels be-

gan selling them under the Personality Ring and Emotion Ring names.

This prompted Carnegie to notify Gimbels of the alleged infringement, but, according to the suit, the department store advertised the rings in a New York newspaper one day later.

Gimbels then continued to sell the rings even after a second notification and has threatened to continue the sales further, the action says.

Carnegie and James, Redwood City, Calif., are seeking treble unstated damages, a ruling that the patent was infringed, injunctions and an accounting. Nims, Howes, Collison & Isner represents the plaintiffs.

Women's Wear Daily, October 3, 1975.

PLAINTIFFS' EXHIBIT 4A.

NIMS, HOWES, COLLISON & ISNER

LINCOLN BUILDING

60 EAST 42ND STREET, NEW YORK, N.Y. 10017

OLIVER P. HOWES JR.
 BERT A. COLLISON
 ROBERT E. ISNER
 THOMAS A. KAIN
 WILLIAM K. GUILD
 H. L. STERN
 RALPH RENALE
 KENNETH R. UMANS
 PETER J. FRANCO
 JAMES MONTALTO

(212) 682-4590
 CABLE: NIMS

September 29, 1975

BY HAND

Gimbel's
 33rd Street & Broadway
 New York, New York 10001



Attention: Max Goldstein, Jewelry Buyer

Dear Sir:

We are the attorneys for Hattie Carnegie Jewelry Enterprises, Ltd., and we write this to reaffirm the telegram we sent to you dated September 27, 1975, stating:

"WE ARE THE ATTORNEYS FOR HATTIE CARNEGIE JEWELRY ENTERPRISES LTD, LICENSED UNDER PATENT NO. 3,802,945 TO MANUFACTURE, SELL AND USE HEAT SENSITIVE NOVELTY DEVICES IN THE FORM OF RINGS AND OTHER JEWELRY. IN OUR OPINION, THE 'PERSONALITY RING' NOW BEING SOLD BY YOU INFRINGES THE AFORESAID PATENT AND THREATENS SERIOUS AND IMMEDIATE DAMAGE TO OUR CLIENT. UNLESS WE RECEIVE PROMPT WRITTEN ASSURANCE BY YOU THAT ALL SALE AND DISTRIBUTION OF THE 'PERSONALITY RING' WILL IMMEDIATELY CEASE, WE SHALL BE FORCED TO TAKE FURTHER AND MORE STRINGENT STEPS TO PROTECT OUR CLIENT'S VALUABLE RIGHTS."

We demand your written assurance by tomorrow, Tuesday, September 30, 1975, that you will cease all sale and distribution of the "personality ring" now being sold by you. If such written

PLAINTIFFS' EXHIBIT 4A

Gimbel's

- 2 -

September 29, 1975

assurance is not forthcoming, we shall take prompt and stringent action to protect our client's valuable rights.

Very truly yours,

NIMS, HOWES, COLLISON & ISNER

By Kenneth A. G. [Signature]

46:mm

PLAINTIFFS' EXHIBIT 4B.

TANCER & TWO, INC.
366 Fifth Avenue
New York, N.Y. 10001



October 3, 1975

R.H. Macy & Co., Inc.
151 West 34th Street
New York, New York 10001

Att: Ronald Walsh, Esq.

Re: Personality Ring

Gentlemen:


In connection with the purchase of our Personality Ring, TM, by you for resale to your customers, you have requested that we furnish you with the following indemnity:

We shall indemnify R.H. Macy & Co., Inc. ("Macy") and hold it harmless from and against all loss, damage, costs, claims, judgments and reasonable expenses including attorney's fees, incurred or paid by Macy in or by reason of any litigation based upon a claim of infringement of any patent arising or resulting from the sale by Macy of our Personality Ring, or based upon a claim of trademark or copyright infringement, or unfair competition attributable to us in connection with the Personality Ring. In the event that any such litigation shall be instituted against Macy, Macy shall give us reasonable prompt notice thereof and shall permit us to defend such litigation by counsel selected by us, provided that such counsel is reasonably acceptable to Macy and we act with all reasonable promptness and diligence in defending Macy in such litigation.

Very truly yours,

TANCER & TWO, INC.

By



Michael Tancer
President

PLAINTIFFS' EXHIBIT 10.

PENNIE & EDMONDS

COUNSELLORS AT LAW

WILLIS E. TAYLOR, JR.	ROBERT J. KADEL
JAMES W. LAIST	DAVID WEIL, III
THOMAS F. REDDY, JR.	CHARLES E. MCKENNEY
STANTON I. LAWRENCE, JR.	RICHARD C. JONES, III
J. PHILIP ANDERLOGG	JAMES G. FOLEY
FRANK F. S. HECK	BERT A. TERZIAN
N. LESLIE MISHOCK	JOHN L. SIGALOS*
CLYDE C. METZGER	GERALD J. FLINTOFF
DAVID J. TOOMEY	PHILIP T. SHANNON
HAROLD A. TRAYER	SIDNEY R. DRESNICK
HUBERT G. MOORE, JR.	BARRY D. REIN
ROBERT MCNAY	JONATHAN A. MARSHALL
KEITH E. MULLENDER	WILLIAM L. GREY
	*VIRGINIA BAR

330 MADISON AVENUE
NEW YORK, N.Y. 10017

(212) 643-8586
CABLE: PENANGOLD

WASHINGTON OFFICE
PENNSYLVANIA BUILDING
WASHINGTON, D.C. 20004

September 22, 1975.

Mr. Michael Gartner
Circle Jewelry Products, Inc.
148 West 24th Street
New York, New York 10011

Re: U.S. Patent No. 3,802,945
For: HEAT SENSITIVE NOVELTY DEVICE

Dear Mr. Gartner:

Following the discussion had with you and Mr. Kroin regarding the subject patent, you requested me to submit a report setting forth my views thereon, both as to the invalidity of the subject patent claims and as to non-infringement thereof by the rings being manufactured and sold by your company. The construction of your rings is shown in the attached sketch and is embodied in the sample rings you left with me which are returned herewith.

The art of liquid crystals to show minute fluctuations in temperature by changing their color is very old (Scientific American, August 1964).

The brochure (Chameleon) of NCR recites a long list of prior references to "Liquid Crystals" including one entitled "The Use Of Liquid Crystals For Thermographic Measurement Of Skin Temperatures Of Man".

Also, NCR is the owner of many prior U.S. patents in the subject field. One of its prior patents, No. 3,585,381, filed April 14, 1969, granted June 15, 1971, is particularly pertinent -- see Xerox copy of Exhibit B attached. This patent was cited by the Patent Office Examiner during the prosecution of the subject patent.

PLAINTIFFS' EXHIBIT 10

Mr. Michael Gartner - 2

Claim 1 of the subject patent is limited to the "transparent body being generally flat and having a peripheral flange defining a recess within said body". Claims 2 and 3 are likewise so limited.

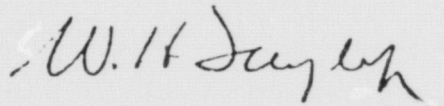
Claims 4 and 5 relate to a tubular structure.

Claims 6 and 7 are limited to "a crystalline liquid encapsulated in turn within said transparent body".

Thus, none of the subject patent claims apply to the construction shown in the sketch Exhibit A of your company's rings.

My opinion is, therefore, that the subject patent is invalid as being obvious in view of the prior art and that the patent is not infringed by the manufacture and sale of your rings (Exhibit A).

Yours very truly,



Willis H. Taylor, Jr.

Encs.

PLAINTIFFS' EXHIBIT 10

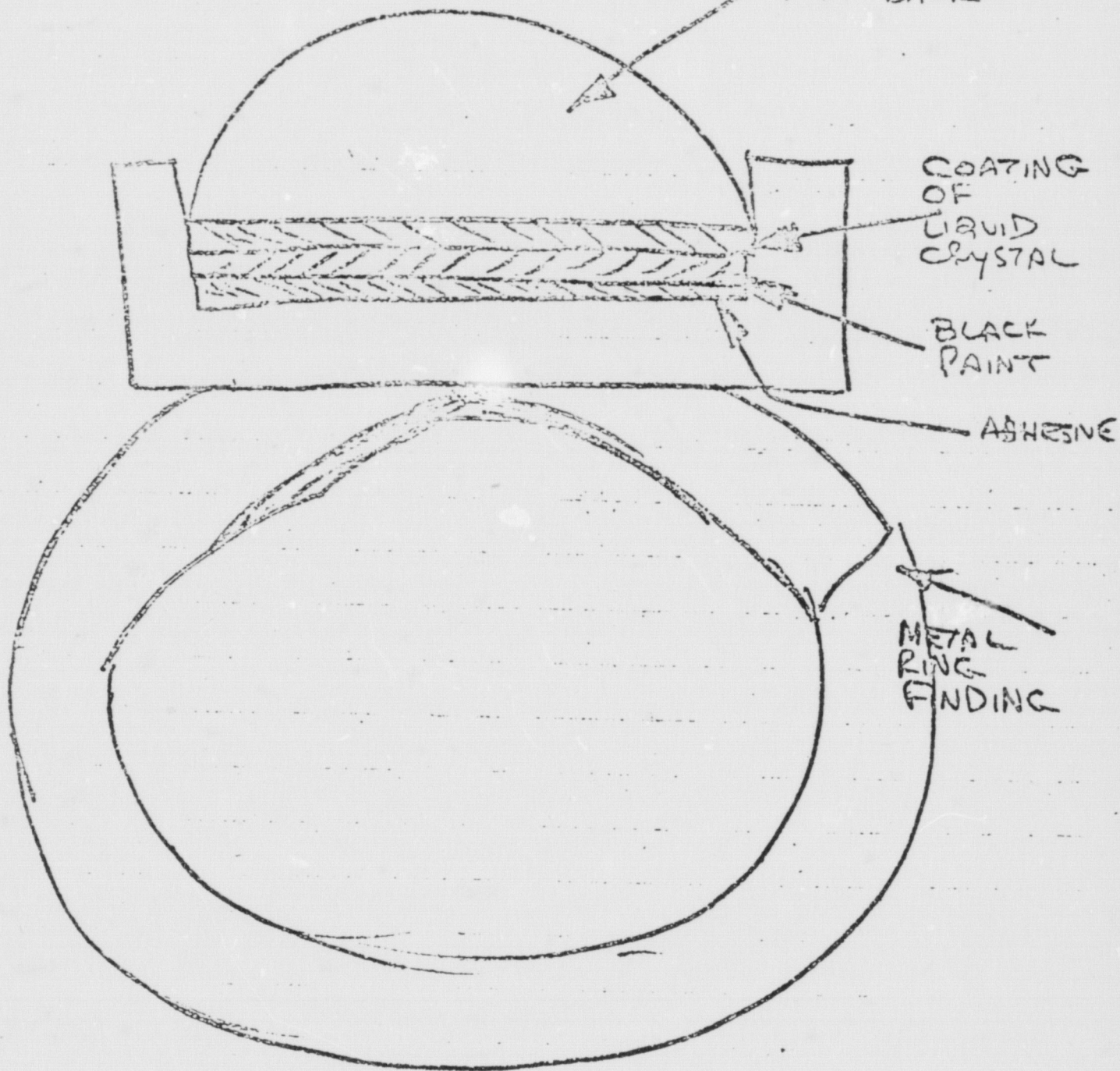
CLEAR GLASS
CABESTON
STONE
FLAT BACK

COATING
OF
LIQUID
CRYSTAL

BLACK
PAINT

ADHESIVE

METAL
RING
FINDING



PLAINTIFF'S EXHIBIT 10

SUPPLEMENTAL REFERENCES

1. Baltzer, D., "Liquid Crystals", Vari-Light Corporation.
2. Ferguson, J. L., "Liquid Crystals", Scientific American, Vol. 211, No. 77, 1964.
3. Davis, F., "Liquid Crystals" A New Tool for NDT", Research and Development, June, 1967.
4. "Liquid Crystals Plot the Hot Spots", Electronic Design 19, September 13, 1967.
5. Brown, G. N., "Liquid Crystals", Industrial Research, May, 1968.
6. Augustine, C. F., "Field Detector Works in Read Time", Electronics, June 24, 1968.
7. Klein, E. J., "Liquid Crystals in Aerodynamic Testing", Astronautics and Aeronautics, July, 1968.
8. Woodmansee, W. E. and Southworth, H. L., "Detection of Material Discontinuities with Liquid Crystals", Materials Evaluation, August, 1968.
9. Ferguson, J. L., "Liquid Crystals in Non-Destructive Testing", Applied Optics, September, 1968, Vol. 7, No. 9.
10. Woodmansee, W. E., "Aerospace Thermal Mapping Applications of Liquid Crystals," Applied Optics, September, 1968.
11. Sprow, E., "Liquid Crystals - A Film in Your Future?", Machine Design, February 6, 1969.
12. Di Roberto, F. and Maggi, G. C., "La Termografia Cutanea A Cristalli Liquidi Microincapsulati", Il Bassini, Vol. XV Fascicolo 1-4, 1970.
13. Selawry, O. S.; Selawry, H. S. and Holland, J. F., "The Use of Liquid Crystals for Thermographic Measurement of Skin Temperature in Man." Molecular Crystals, 1966, Vol. 1. ppg. 495-501.
14. Castellano, J. A. and Brown, G. H., "Thermotropic Liquid Crystals," Chemtech, January, 1973.

PLAINTIFFS' EXHIBIT 10

Chameleon can also be supplied in the form of coatings on a variety of substrates. Standard substrates include various paper stocks and mylar. Substrates normally used are black, or they can be coated with an absorptive black background. The Chameleon can also be coated without an absorptive black background. Other non-standard substrates such as styrene, vinyls, acetates, acrylics, glass, or metals have also been coated with Chameleon with and without the black background. Laboratory samples can be supplied on a special request basis.

As a result of encapsulation, a unique application of liquid crystals becomes possible. NCR has the capability of printing Chameleon in the shape of letters, numbers and images on mylar, paper, and other substrates. Thus, by combining this capability with the added brilliance of the new Chromatic Chameleon, NCR can provide a singular creative form of art which may be utilized in toys, novelties, premiums, advertising and sales promotion.

PLAINTIFFS' EXHIBIT 11.

GOTTLIEB, RACKMAN, REISMAN & KIRSCH, P. C.
COUNSELORS AT LAW

260 MADISON AVENUE, NEW YORK, N. Y. 10016

JAMES REISMAN
MICHAEL I. RACKMAN
GEORGE GOTTLIEB
JULES P. KIRSCH
BARRY A. COOPER

212-689-0040

PATENTS
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September 25, 1975

BY HAND

Ira Greenblatt, Esq.
Tenzer, Greenblatt, Fallon
& Kaplan
100 Park Avenue
New York, New York 10017

Re: "The Personality Ring"

Dear Ira:

We have been requested to render an opinion to Tancer & Two, Inc. on the question of whether a ring, being marketed as "The Personality Ring", infringes Patent No. 3,802,945, and whether that patent is valid.

By way of background, we understand that Circle Jewelry Products, Inc. of 148 West 24th Street, New York, New York intends to supply Tancer & Two, Inc. with this ring, which is a "novelty". The ring includes a transparent, dome-shaped glass body, having a flat under-surface. To this under-surface is applied an encapsulated liquid crystal, so as to form a film across the under-surface. A sealant is then placed under the film, and a brass ring fits around this structure. The glass, film, sealant and brass ring are finally placed into a standard ring setting. The liquid crystal has the property of changing color, as a function of the temperature of the hand on which it is worn. The ring's construction is shown as Exhibit A to an opinion letter from Pennie & Edmonds, dated September 22, 1975.

Hattie Carnegie Jewelry Enterprises Ltd. recently ran an advertisement in Women's Wear Daily which indicated that it was the licensee under a patent on this type of ring and it would take appropriate action against all infringers. Hattie Carnegie has informed us that the patent to which the advertisement referred, is Patent No. 3,802,945, issued April 9, 1974, to Bill G. James of Redwood City, California, and entitled "Heat Sensitive Novelty Device".

PLAINTIFFS' EXHIBIT 11

Ira Greenblatt, Esq.

Page 2

This patent is directed to the utilization of liquid crystalline materials which change color as a function of temperature and which are used in various pieces of jewelry, such as rings, pendants and tie clips. The patent shows various constructions whereby a film of encapsulated liquid crystal may be placed against a transparent body in a jewelry device, to achieve a display of various colors as a function of body temperature.

This patent includes seven claims. Only claims 1 through 5 are applicable to a ring. Each of claims 1 through 5 requires that the transparent body of the ring, such as the glass body, have a recess formed within it, into which the encapsulated crystalline liquid is placed.

Since the ring being manufactured by Circle Jewelry and being marketed by Tancer & Two, Inc., has no recess at the bottom of a transparent body, but rather only has a flat surface, there is no infringement of Patent No. 3,802,945 by the Circle Jewelry ring.

We have further had only a limited opportunity to review some of the prior art. Specifically, we have reviewed cited Patent Nos. 3,637,291; 3,647,280; and 3,720,623, and have reviewed the abstracts of cited Patent Nos. 3,574,043 and 3,585,381, as contained in the Official Gazette, and have reviewed an article in the August 1964 edition of Scientific American, entitled "Liquid Crystals".

Based upon this limited review, we find that it is well-known that certain liquid crystals do change colors as a function of temperature, and that this change of color is optically perceivable. Moreover, it is known to encapsulate such liquid crystals and to utilize them in various mechanical devices such as reflecting materials, scoreboards and other assemblies. In many of these devices, the encapsulated liquid crystal is in fact placed into some sort of a recess, and is then sealed. This is an obvious mechanical expedient.

Based upon our limited study, it is our opinion that Patent No. 3,802,945 is of doubtful validity. Since it is known to encapsulate liquid crystal, since it is known to place such an encapsulated liquid crystal in a recess in a mechanical device, since it is known to seal such

PLAINTIFFS' EXHIBIT 11

Ira Greenblatt, Esq.

Page 3

recess, and since it is known that the resulting construction will show different colors as a result of temperature change, it is our conclusion that a court would be likely to find the incorporation of encapsulated liquid crystal specifically into a recess in the transparent body of a ring, to be an obvious expedient, well within the normal skill of a technician conversent with the jewelry art.

Very truly yours,

GOTTLIEB, RACKMAN, REISMAN & KIRSCH


George Gottlieb

GG:et

PLAINTIFFS' EXHIBIT 12.

October 6, 1975

Kenneth Uman, Esq.
Nims, Howes, Collison & Isman
60 E. 42nd St.
New York, N.Y.

Re: "The Personality Ring"

Dear Mr. Uman:

In accordance with our telephone conversation, I am enclosing a copy of the opinion letter submitted by Messrs. Gottlieb, Rackman, Reisman & Kirsch in connection with the "Personality Ring" TM.

We have in our possession similar opinions submitted by Pennie & Edmonds, Esqs. and Salter & Michaelson, Esqs. We are also aware of a similar opinion rendered by Messrs. Amster & Rothstein, Esqs., a copy of which we anticipate having in our possession shortly.

I would appreciate your communicating with me after you have had an opportunity of studying the enclosed letter.

Very truly yours,

TENZER, GREENBLATT, FALLON & KAPLAN

Ira J. Greenblatt

IJG/lk
Encl.

By Hand

PLAINTIFFS' EXHIBIT 13.

IN THE UNITED STATES DISTRICT COURT
FOR THE SOUTHERN DISTRICT OF NEW YORK

----- x
BILL G. JAMES and
HATTIE CARNEGIE JEWELRY ENTERPRISES LTD.,

Plaintiffs,

CIVIL ACTION NO.

v.

GIMBEL BROTHERS, INC.,

Defendant.

75 CIV. 4844

EDWARD POLLACK

COMPLAINT

For their Complaint herein, plaintiffs allege:

1. This is a suit of a civil nature for infringement of a U.S. patent under the Patent Laws of the United States. The matter in controversy exceeds, exclusive of interest and costs, the value of Ten Thousand Dollars (\$10,000). This action arises under 35 U.S.C. Section 271, et seq., and jurisdiction is conferred upon this Court by 28 U.S.C. Section 1338(a).

2. Plaintiff Bill G. James is an individual residing at 1895 Cordilleras Road, Redwood City, California, and was on April 9, 1974 issued United States Letters Patent No. 3,802,945 for a heat sensitive novelty device. A copy of said patent is attached hereto as Exhibit A and incorporated herein by reference.

3. Plaintiff Hattie Carnegie Jewelry Enterprises Ltd. is a New York corporation, having a principal place of business at 10 East 38th Street, New York, New York 10016.

4. Upon information and belief, defendant Gimbel Brothers, Inc. is a New York corporation, with a principal place of business at 1275 Broadway, New York, New York.

PLAINTIFFS' EXHIBIT 13

5. Plaintiffs Bill G. James and Hattie Carnegie Jewelry Enterprises Ltd. have executed an Agreement, dated September 1, 1975, whereby plaintiff Bill G. James licensed Hattie Carnegie Jewelry Enterprises Ltd. to make or have made for it items of heat sensitive jewelry embodying the invention claimed in the aforesaid Patent No. 3,802,945.

6. On September 19, 1975, plaintiff Hattie Carnegie gave notice to the trade in Women's Wear Daily that the heat sensitive jewelry which is the subject matter of this action was covered by a United States Patent and that it would rigorously defend its rights against infringers of said patent.

7. Upon information and belief, the jewelry buyer for defendant Gimbel Brothers was informed by plaintiff prior to the running of the notice in Women's Wear Daily that a patent existed covering the heat sensitive jewelry in question and that Hattie Carnegie would be licensed to sell heat sensitive jewelry by the patent owner.

8. Upon information and belief, defendant Gimbel Brothers with knowledge that a patent existed covering such heat sensitive jewelry, ordered a substantial number of heat sensitive rings from an unlicensed distributor, Perry Ltd.

9. Upon information and belief, the heat sensitive rings purchased by Gimbel Brothers were first placed on sale for retail customers on September 26, 1975, and said rings were sold under the names "Personality Ring" and "Emotion Ring".

10. Upon information and belief, the heat sensitive rings sold by Gimbel Brothers infringe the claims granted in plaintiff James' Patent No. 3,802,945.

PLAINTIFFS' EXHIBIT 13

11. On September 27, 1975, plaintiff Hattie Carnegie Jewelry Enterprises Ltd., through its attorneys, sent a telegram to the President of Gimbel Brothers, its jewelry buyers and its Legal Department, asserting their opinion that the ring sold by Gimbel Brothers infringed plaintiff James' Patent and requesting that all sales of said item immediately cease.

12. On September 28, 1975, Gimbel Brothers took out a half page advertisement in the New York Daily News relating to its sale of the heat sensitive ring which is the subject matter of this action. A copy of said advertisement is attached hereto as Exhibit B.

13. On September 29, 1975, plaintiff Hattie Carnegie Jewelry Enterprises Ltd., through its attorneys, hand delivered letters to Gimbel's president, its jewelry buyers and its Legal Department reasserting the requests made in the telegrams sent September 27, 1975.

14. Upon information and belief Gimbel Brothers, Inc. on September 29, 1975, continued to sell the heat sensitive rings, which are the subject matter of this action, despite the receipt of plaintiff Hattie Carnegie's letters.

15. Upon information and belief, Gimbel Brothers threatens to continue sale of the heat sensitive rings, which are the subject matter of this action.

16. Upon information and belief, the sale by Gimbel Brothers of the alleged infringing rings has seriously damaged and threatens to continue to damage plaintiffs' market for such heat sensitive rings and other heat sensitive jewelry covered by plaintiff James' patent.

PLAINTIFFS' EXHIBIT 13

17. Upon information and belief, as a result of defendant Gimbel Brothers infringing acts, plaintiffs have suffered irreparable injury, resulting in loss of customers, business, good-will and reputation in an amount far in excess of Ten Thousand Dollars (\$10,000), and unless defendant is enjoined from continuing its infringing acts, plaintiffs will suffer further and additional loss of customers, business, good-will and reputation.

WHEREFORE, plaintiffs pray:

1. That judgment be entered in favor of plaintiffs and against defendant that defendant Gimbel Brothers, Inc. infringed plaintiffs' patent.
2. That defendant, its agents, servants, employees, attorneys, confederates and all persons acting for, with, by, through or under it, and each of them be enjoined and restrained at first during the pendency of this action and thereafter perpetually from selling the infringing heat sensitive rings, which are the subject matter of this action, or any other heat sensitive devices covered by plaintiff James' patent.
3. For an accounting to determine defendant's profits and plaintiffs' damages by reason of defendant's infringement and in light of defendant's willful and deliberate infringement, as finding of my findings found by this Court.
4. For reasonable attorneys' fees.

PLAINTIFFS' EXHIBIT 13

5. For costs and disbursements in this action and for such other and further relief as this Court may deem just and the circumstances warrant.

Dated: October 2, 1975.

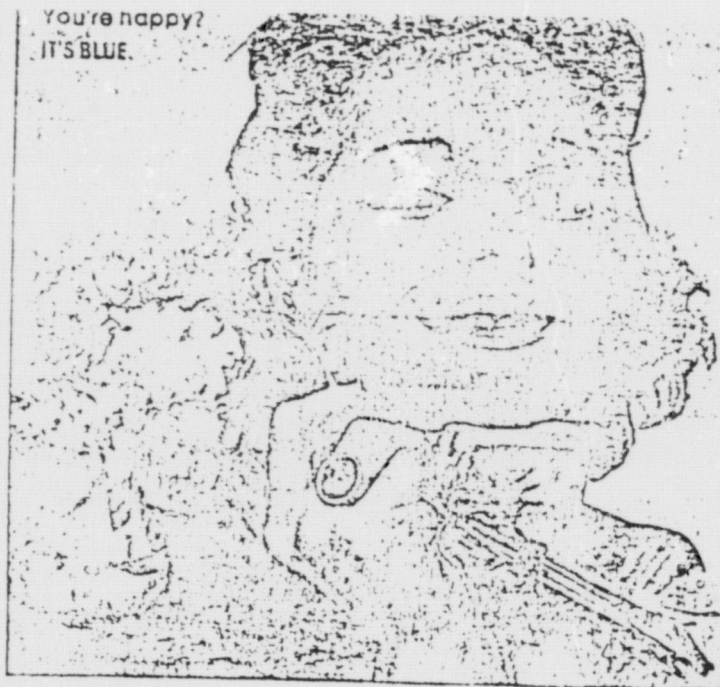
NIMS, HOWES, COLLISON & ISSER
Attorneys for Plaintiffs

By Kenneth R. G. [Signature]

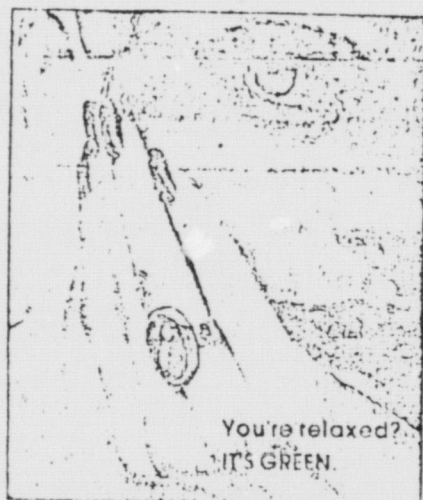
60 East 42nd Street
New York, New York 10017
(212) 682-4590

PLAINTIFFS' EXHIBIT 13

You're happy?
IT'S BLUE.



SUNDAY NEWS, SEPTEMBER 28, 1976



You're relaxed?
IT'S GREEN.



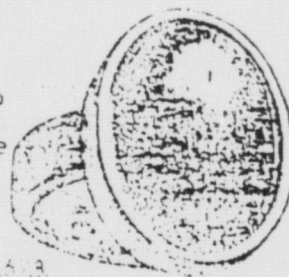
See it change color as your mood does.

THE SENSITIVITY RING

at a sensible price

\$5

Reflects your state of mind. Responds to the heat and energy level of your hand. Is it for fun... or for real? Whichever, it's the new jewelry thing you've been reading about. The color-therm ring that tells of the color of your mood. The color-therm ring for women and men. Available in 14K and 18K gold. Sizes 5.5-8.



Ring and gemstone detail.

GIMBELS

1000 Broadway, New York, N.Y. 10018 (212) 675-1234

Buy Sensitivity Rings at Gimbel's

Gimbel's is a registered trademark of Gimbel's Department Stores, Inc. © 1976

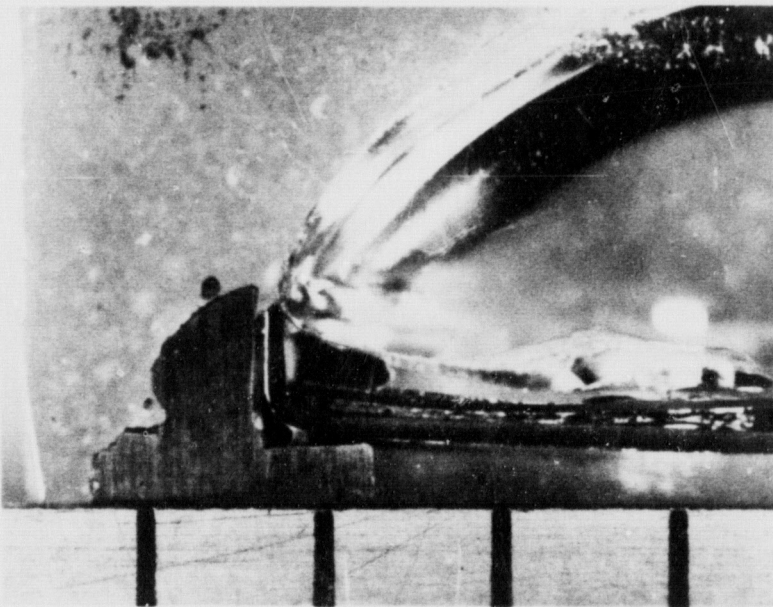
DEFENDANTS' EXHIBIT A.

NEW YORK TESTING LABORATORIES, INC.

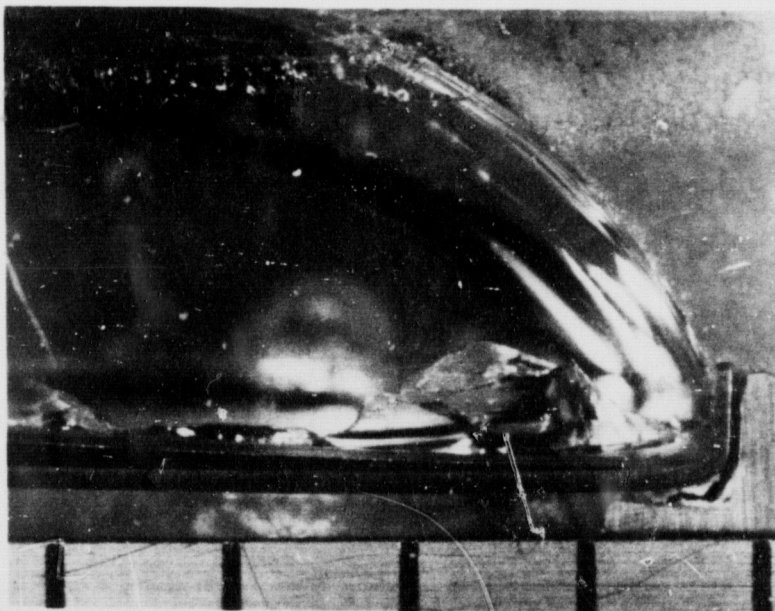
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PHOTOGRAPHS - Lot No. 2



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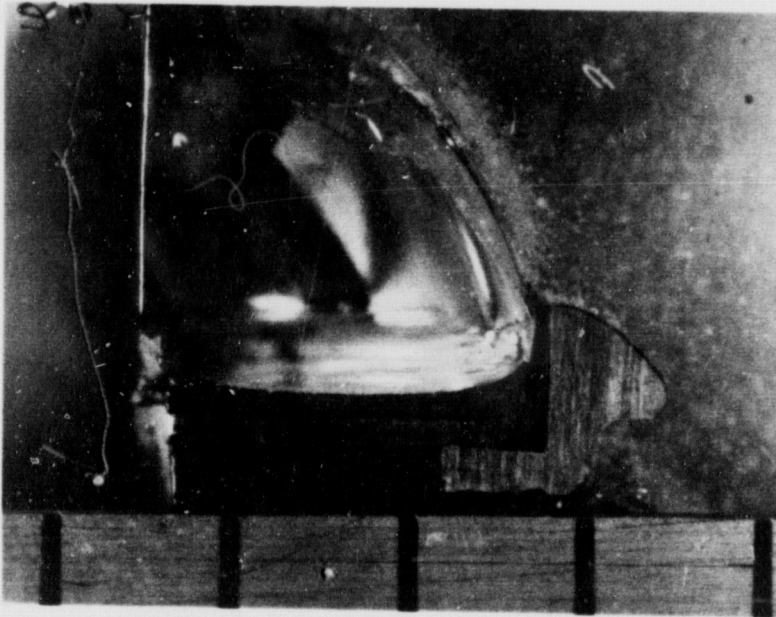
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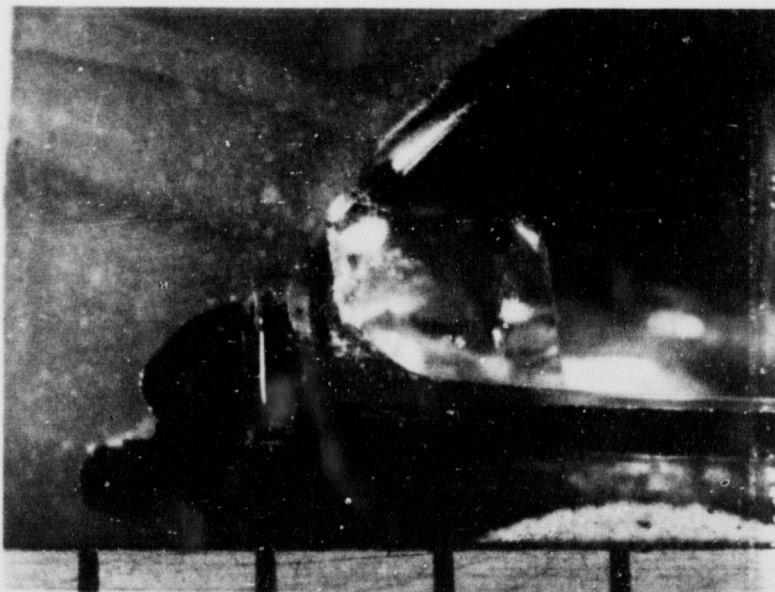
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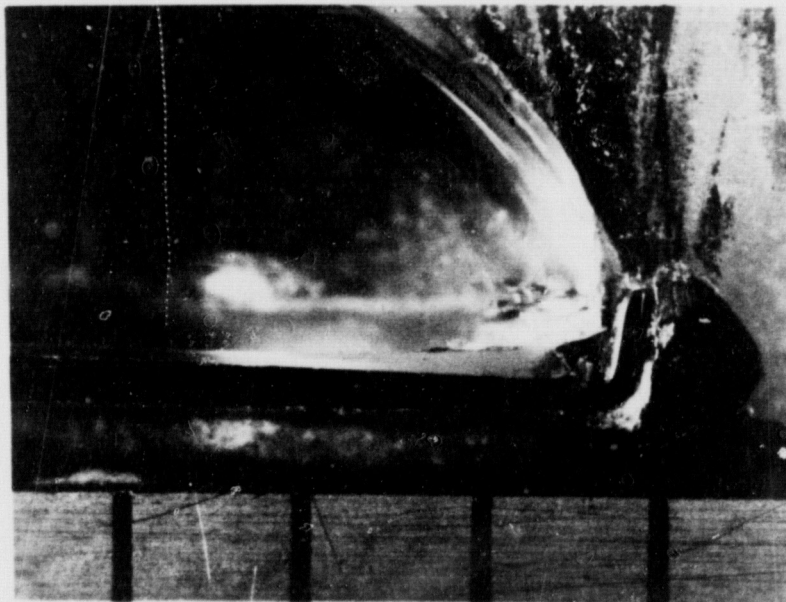
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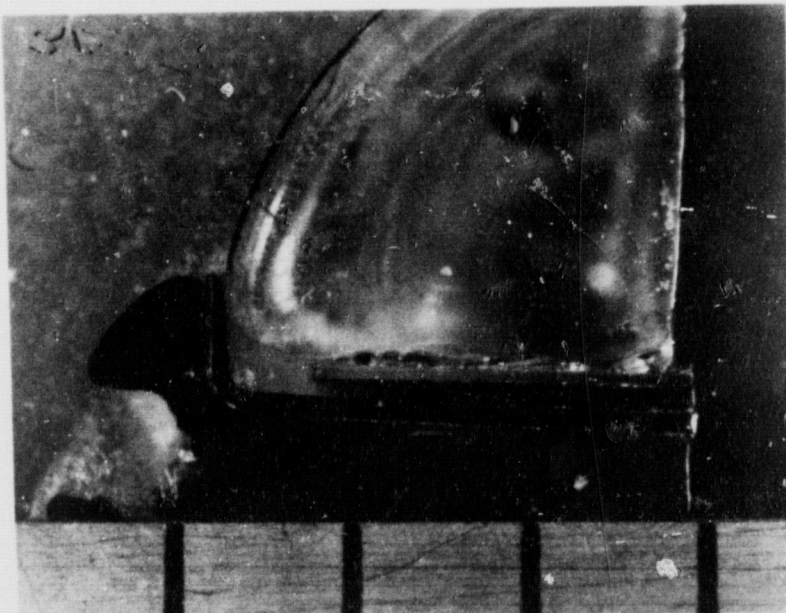
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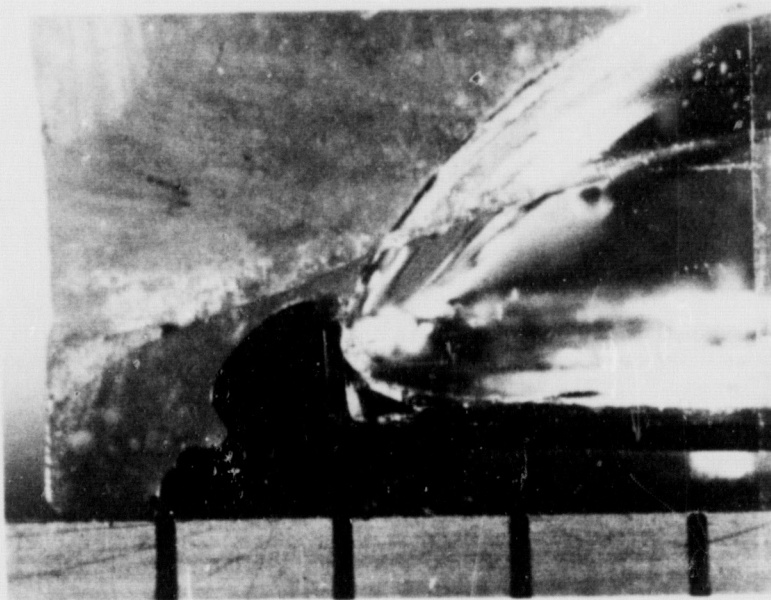
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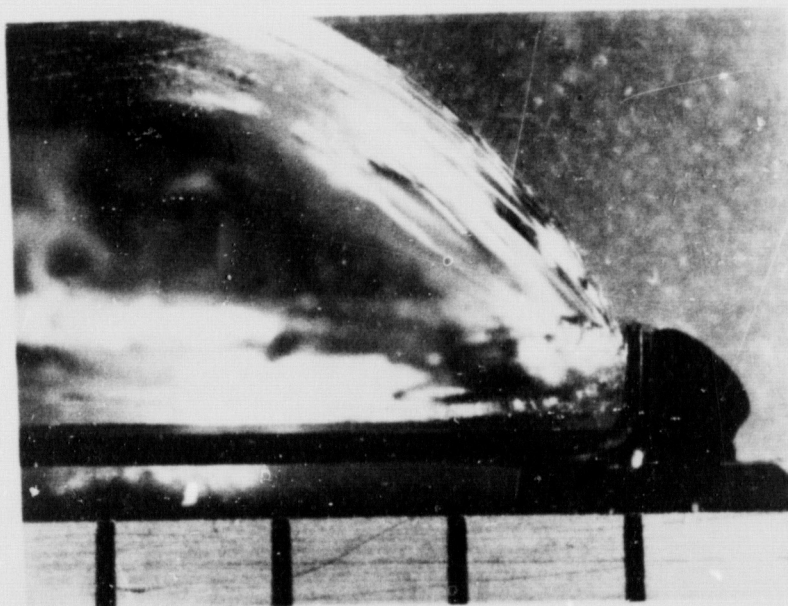
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DEFENDANTS' EXHIBIT A

NEW YORK TESTING LABORATORIES, INC.

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DEFENDANTS' EXHIBIT C.

NEW YORK TESTING LABORATORIES, INC.

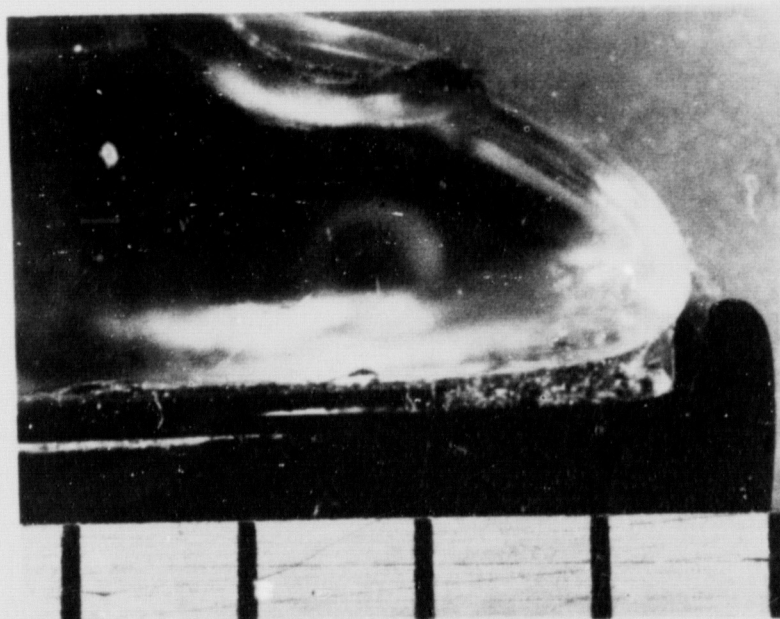
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PHOTOGRAPHS - Lot No. 3



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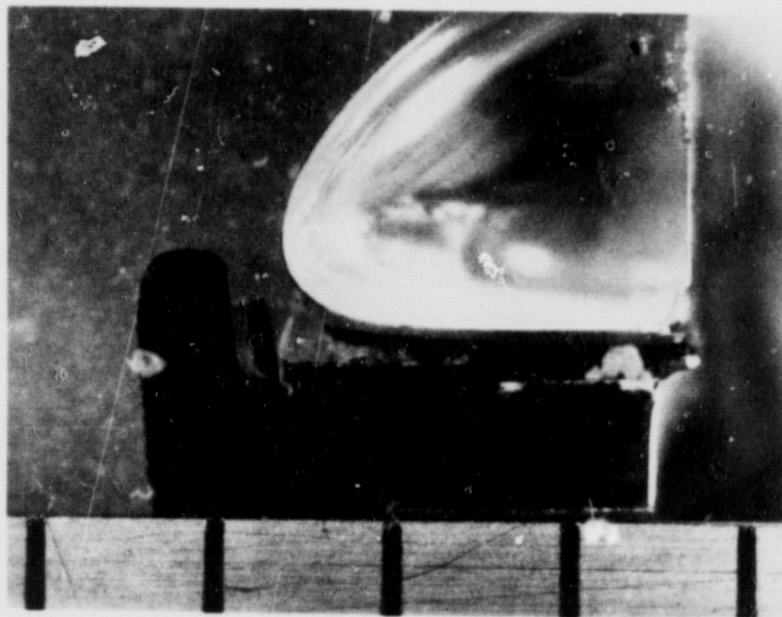
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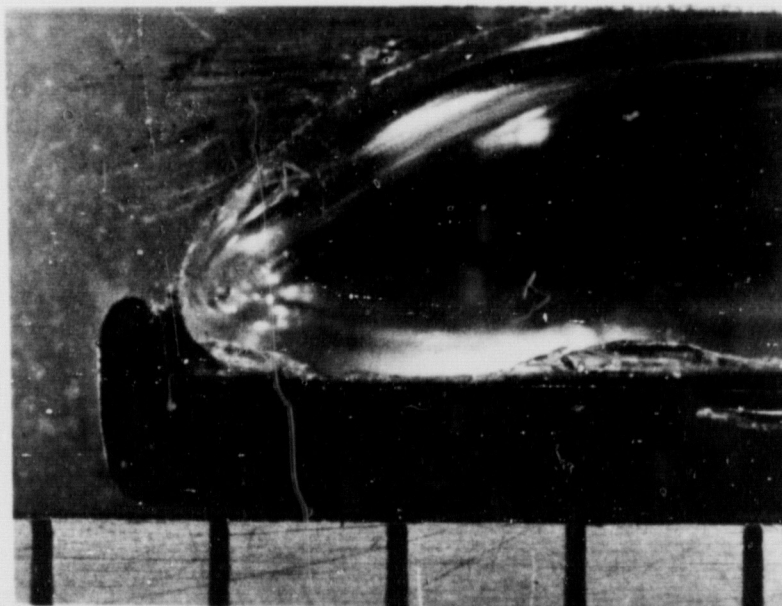
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DEFENDANTS' EXHIBIT C

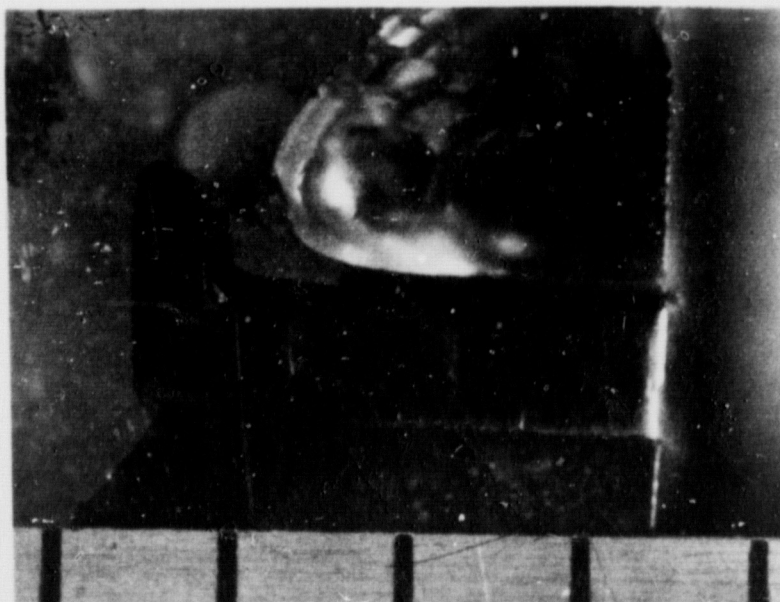
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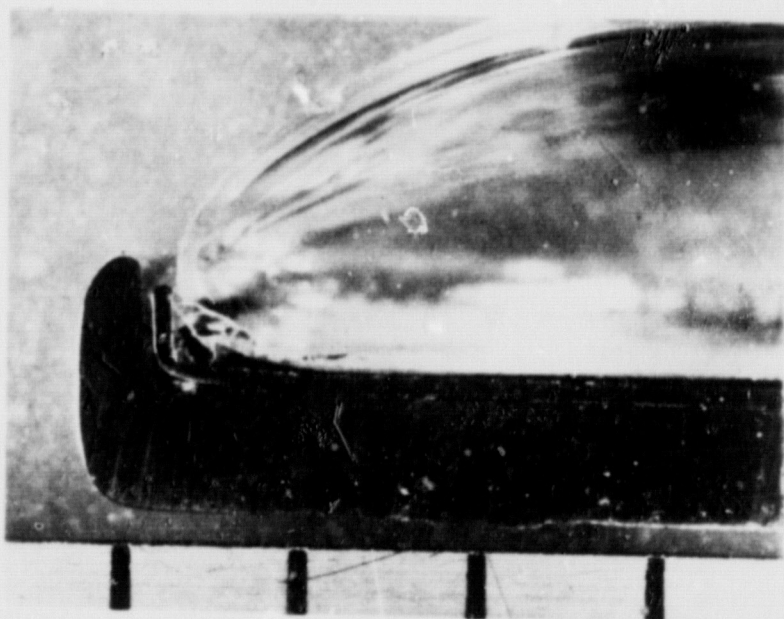
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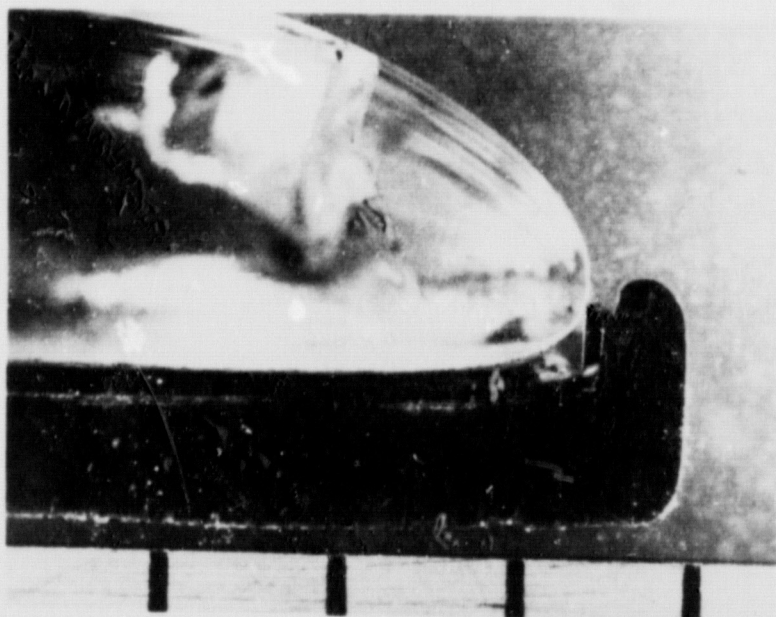
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DEFENDANTS' EXHIBIT C

NEW YORK TESTING LABORATORIES, INC.

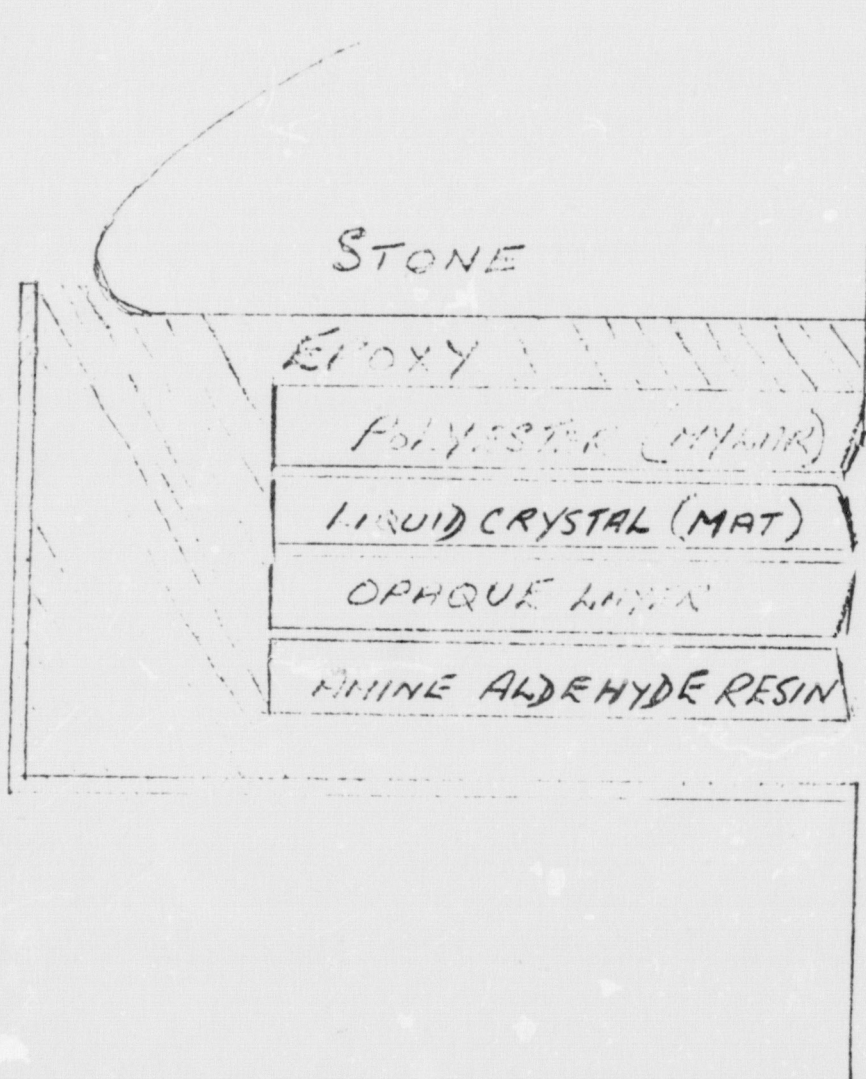
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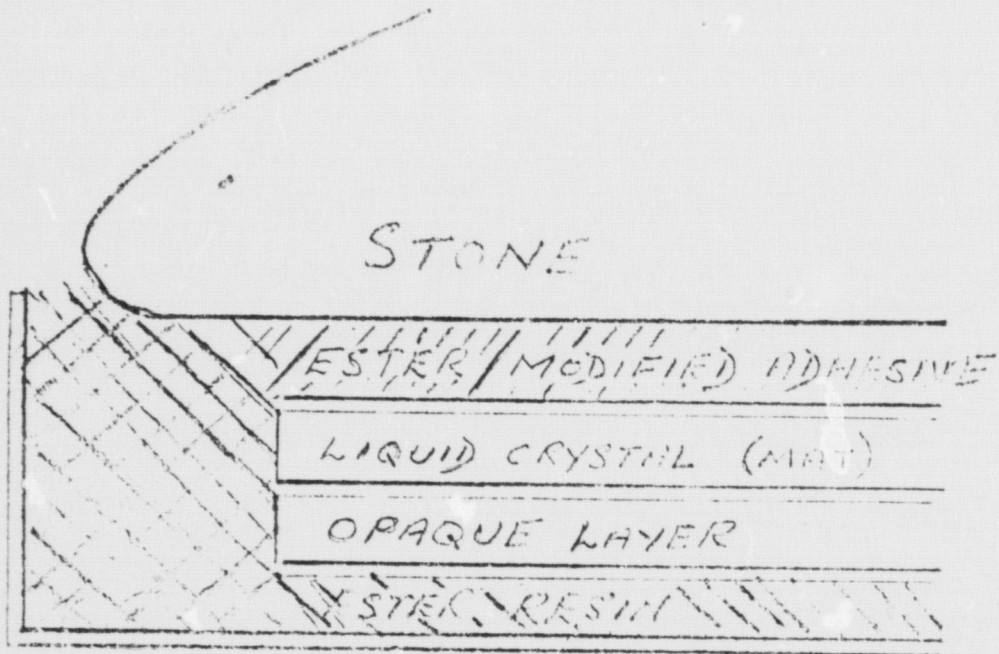
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DEFENDANTS' EXHIBIT E.



Lot No. 2

DEFENDANTS' EXHIBIT F.



LOT 3